The *Aedes* Mosquitoes of the Philippine Islands
III. Subgenera *Aedimorphus, Banksinella, Aedes,* and *Cancraëdes* (Diptera, Culicidae)[1]

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INTRODUCTION

THIS IS THE LAST of a series of three papers dealing with the *Aedes* fauna of the Philippine Islands. Part I (Knight and Hull, 1951) contained the general introduction, the keys to the adults and larvae, and the species treatments for the subgenera *Mucidus*, *Ochlerotatus*, and *Finlaya*. Part II (Knight and Hull, 1952) dealt with the subgenera *Skusea*, *Christophersiomyia*, *Geoskusea*, *Rhinoskusea*, and *Stegomyia*. In this part the remaining aedine subgenera known from the Philippines are considered, i.e., *Aedimorphus*, *Banksinella*, *Aedes*, and *Cancraëdes*.

All the necessary introductory information is given in Part I, and only explanations needed for an understanding of the abbreviations and symbols used are repeated here.

A dagger(†) denotes types that have been examined by us.

The following abbreviations are used in the descriptions. Adult: *apn*, anterior pronotal lobe; *ppn*, posterior pronotal lobe. Larva: *isc*, inner or upper caudal hair of the anal segment; *osc*, outer or lower caudal hair of anal segment; *lh*, lateral hair on anal plate.

Figures are not drawn to scale.

The following abbreviations are used in the species distribution sections to indicate the present locations of specimens examined. A.N.S.P., Academy of Natural Sciences of Philadelphia; C.A.S., California Academy of Sciences; U.S.N.M., U. S. National Museum; B.M., British Museum (Natural History); C.C., Cornell University; R.K.L., specimens from the collection of Naval Medical Research Unit No. 2 on which nothing has been previously published and which are now deposited in the U. S. National Museum, the Johns Hopkins University, the California Academy of Sciences, the British Museum, and the Knight collection.

SYSTEMATICS

Subgenus AEDIMORPHUS Theobald

1903. *Aedimorphus* Theobald, Mon. Cul. 3: 290. Genotype: *domesticus* Theobald (Africa).

1905. *Reedomyia* Ludlow, Canad. Ent. 37: 94. Genotype: *pampangensis* Ludlow (Philippines).

ADULT: Brown species, some with distinctive areas of silvery scaling. In general related to *Stegomyia*, but all the Philippine species distinct from that subgenus in the form of the male palpi (except the undescribed species mentioned in the discussion of *wainwrighti*) and of the dististyle of the male terminalia. Male palpi longer than the proboscis; segments IV–V down-tilted, numerous long hairs arising laterally and apically on the distal portion of III and all along IV–V (the unde-

[1] The opinions or conclusions contained herein are those of the authors and are not to be construed as official or reflecting the views of the Navy Department or of the Naval service at large. Manuscript received August 12, 1952.

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scribed species mentioned above has slender, relatively hairless palpi as in *Stegomyia*). Vertex dorsum with a variable area of narrow scales medially (confined to nape in *wainwrighti* and in some specimens of *ostentatio;* all narrow-scaled in v. *nocturnus*), remainder broad-scaled. Scutellum either broad- or narrow-scaled. Paratergite with or without scales. No lower mesepimeral bristles. Fore and mid-tarsal claws of male unequal, each unidentate; hind claws equal, simple. Tarsal claws of female equal, fore and mid each unidentate; hind simple. *Terminalia:* Basistyle without true apical lobes and without basal lobe, except in v. *nocturnus* where a setose basal plaque occurs. Dististyle greatly swollen apically, except in v. *nocturnus*, the enlarged portion bearing a complicated arrangement of hairs and modified setae. Claspettes absent. Mesosome divided into two lateral plates, each of which bears several teeth laterally.

LARVA: Separable from all the other subgenera in the Philippines, except *Ochlerotatus* and some specimens of the *Finlaya* species *leucopleurus* and *aureostriatus*, by the possession of an acus on the anal plate. Antennal hair tuft with 5–13 branches. Head hair 4 with 2–8 branches, 5 and 6 with 1–7. Comb with 16–26 small scales in a patch, or with 8–10 large teeth in an irregular, partially double row. Siphon with an attached acus; 12–21 pecten teeth, each with one or more large ventral denticles; distal teeth more widely spaced and without denticles. Anal plate incomplete; ventral brush of 12–16 tufts, all but basal 1–4 borne on a prominent, laterally connected barred area. Habitat chiefly rain-filled temporary pools, but also occasionally such places as stream margins and permanent pools and ditches.

DISTRIBUTION: Seven species are known from the Philippines. This subgenus is largely confined to the Ethiopian and Oriental regions.

SYSTEMATICS: Edwards (1932: 166) divided the subgenus into eight groups. Knight and Hurlbut (1949: 29) modified this classification by combining Group D with Group C.

No sharp division occurs between *Stegomyia* and *Aedimorphus*, the two subgenera being apparently intimately connected through Group A (*apicoannulatus*-group) of the Ethiopian region and through Group B (*nummatus*-group) of the Oriental region (via Group E of *Stegomyia*).

In the Philippine fauna, Group C is represented by *alboscutellatus*, *mindoroensis*, *pampangensis*, and *punctifemore*. In that fauna it is separable from Group G, represented only by *vexans nocturnus*, in the absence of a basal lobe on the basistyle and in the possession of an apically swollen and markedly modified dististyle. The positions of *ostentatio* and *wainwrighti* are uncertain because the males are as yet undescribed. The other groups are not represented in the Philippines.

Aedes (Aedimorphus) pampangensis (Ludlow)

Figs. 1, 2

1905. *Reedomyia pampangensis* Ludlow, Canad. Ent. 37: 94 (3 females). Type locality: Philippines. Angeles, Pampanga Prov., Luzon (Whitmore). However, the specimen in the U.S.N.M. is labeled "Camp Wm. McKinley, Rizal, P. I., Nov. 3. 05." in Ludlow's handwriting. Type: Female (holotype) in U.S.N.M.†

1922. *Aedes* (*Ecculex*) *alboscutellatus*, Theobald. Edwards, Indian Jour. Med. Res. 10: 467. In part.

1925. *Aëdes* (*Aëdimorphus*) *niveoscutella* Theobald. Dyar and Shannon, Insecutor Inscitiae Menstruus 13: 76.

1932. *A.* (*A.*) *alboscutellatus* Theobald. Edwards, Genera Insectorum. Fasc. 194, p. 167, Barraud, 1934, 250. In part.

1945. *Aedes* (*Aedimorphus*) *pampangensis* (Ludlow). Bohart, U. S. NavMed. 580, p. 53. Different combination.

ADULT: Vertex dorsum with a median narrow-scaled area. Scutum uniformly brown-

scaled. Scutellum with broad silvery scales. Tarsi all dark.

Male. Head: Proboscis pale, apical one-fourth dusky, particularly dorsally. Palpi slightly longer than proboscis; dark; segments IV–V down-tilted, numerous long hairs arising apically and all along IV–V. Vertex with a narrow area of narrow pale scales along either side of mid-line, a line of narrow pale scales along the dorsal portion of the eye margins; remainder of vertex with broad yellowish-white scales; brown upright-forked scales over the whole dorsum. *Thorax:* Scutal integument brown; clothed with small, narrow brown scales, may be a few narrow yellowish scales along the anterior margin, over the wing base, and on the prescutellar area. Scutellar lobes covered with broad silvery-white scales. *Apn* with a few narrow yellowish scales; *ppn* sparsely covered with narrow brownish and yellowish scales. Propleuron, subspiracular area, and paratergite each with some narrowed yellowish scales; upper sternopleuron, lower posterior sternopleuron, and upper mesepimeron each with small patch of broad creamy-white scales. *Legs:* Fore femur with anterior surface dark, paler basally; posterior surface with dorsal half pale, remainder dark; dorsal surface pale. Mid-femur dark anteriorly except for a few silvery-white scales dorsally at apex; posterior surface pale except for a narrow dorsal dark area on apical half. Hind femur pale, dark dorsally, this dark scaling encroaching onto the anterior and posterior surfaces along apical one-half; a narrow apical band of silvery-white scales anteriorly. Tibiae with posterior surfaces pale-scaled. Tarsi all dark-scaled. Fore and mid-tarsal claws unequal, each claw unidentate; hind tarsal claws equal, simple. *Wings:* Dark-scaled. Halter stem pale, knob with dusky scales. *Abdomen:* Tergites dorsally dark (may be a few median basal yellowish scales on IV–V); a lateral patch of creamy-white scales on I, II–VII with a complete lateral band of brownish-yellow scales, these basally encroaching upon the dorsum on V–VII. Sternite VIII with a dense divided tuft of very long yellow hairs. *Terminalia:* Basistyle broad, short; a dense band of very long setae on tergal surface; a subbasal tuft of short, curved setae on inner tergal surface, some of these setae being distinctively broadened; basad of this tuft and on the inner sternal margin is a small group of setae, 2–3 of these being rather stout; apically on the inner sternal surface is a group of very long setae. Dististyle very distinctive in form; inner surface as figured; outer surface with numerous very short setae and with a large tuft of long setae directed toward base of dististyle (shown by the group of dashed lines in the figure).

FIG. 1. *A.* (*Aedimorphus*) *pampangensis.* Male terminalia (Luzon).

Female. Differs from the male mainly as follows: Proboscis dusky, pale beneath from near base to about the apical one-fourth. Palpi

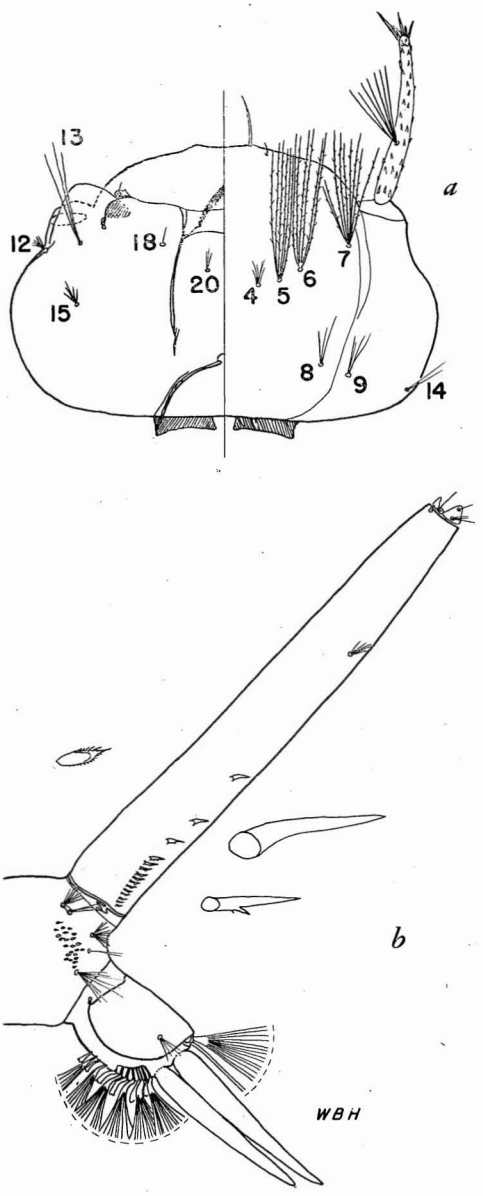

FIG. 2. *A. (Aedimorphus) pampangensis.* Larva (Mindanao). *a*, Head; *b*, terminal segments.

about one-sixth as long as the proboscis; dusky. Torus with dusky hairs mesally. Vertex with dorsum narrow-scaled, these narrow scales brownish along anterior margin, remainder pale; sometimes a small dark anterior patch of broad dark scales at lateral margin of dorsal narrow scales. Scutellar lobes covered with broad silvery-white scales, some narrow ones may also be present. Postspiracular area with narrow yellowish scales. Fore femur with posterior dark-scaled portion more reduced than in male. Fore and mid tibiae pale except for dorsal surface; hind tibia with a pale longitudinal line on both anterior and posterior surfaces. Tarsal claws equal, fore and mid each unidentate, hind simple. Tergites dorsally dark, IV–VII with an indefinite median brownish-yellow area which may extend the whole width of the segment; the pale lateral areas not encroaching dorsally. Sternites with whitish-yellow scales.

LARVA: *Head:* Antennal shaft with heavy spicules, shaft darkened except for small basal area; antennal hair tuft with 7–13 branches. Mouth brush with comb-like tips. Hair 4 with 5–8 branches, very small; 5 with 6–7; 6 with 4–6; 7 with 7–11; 8 with 2–4; 9 with 3–5; 12 with 5–7; 13 with 2–4; 14 with 1–2; 15 with 5–9; 17 and 18 single, spine-like; 20 with 2–4. Mentum with about 16–17 small lateral teeth. *Thorax:* Prothoracic hair 1 single (considerably longer than 2 or 3); 2 with 2–3 branches; 3 with 3–4. Mesothoracic hair 9 with 8–10 branches; 10 and 12 single; 11 with 1–2, very small. Metathoracic hair 9 with 6–8 branches; 10 single; 11 with 1–2, very small; 12 with 1–2, much smaller than on mesothorax. *Abdomen:* Dorsolateral hair on I with 5–7 branches; on II with 6–7. Lateral hair on I with 3–4; on II and III with 4–7; no distinctly developed lateral hairs on remainder of segments. Pentad hair 1 with 6–8 branches; 2 with 2–4 (on same basal tubercle as hair 1); 3 with 15–20; 4 with 2–4; 5 with 5–9. Comb with about 16–20 small scales in a patch, each scale with base broadly ovoid and spine proper very slender and short, a fringe along most of basal portion of scale. Siphon long, slender, acus present, index about 7.0; 12–18 pecten teeth, the last 2–4 teeth simple and more widely separated from one another, remainder darker and each with 1–2 ventral denticles; siphon hair tuft with 5–7 branches, very small and pale, inserted at apical one-fourth. Anal

plate incomplete, an acus present; *lh* with 2–4 branches, very small and obscure; *isc* with 13–17 branches, about equal to anal plate in length; ventral brush of 12 tufts, all but basal 3–4 arising from a connected barred area, each tuft with 11–15 branches. Anal gills long, lanceolate, dorsal pair slightly longer than ventral pair and about twice as long as anal plate.

BIONOMICS: The adult was not encountered in nature. The larvae were collected from scattered rain pools in a grassy area, from a stream margin containing algae and other vegetation, and from a grassy pool in the bed of a temporary stream.

DISTRIBUTION: *Specimens examined.* U. S. N.M. Luzon: 4 males, 5 females, 8 sets assoc. skins, Olongapo, Subic Bay, Zambales Prov. (Rozeboom, Zolik). One female, 1 assoc. larval skin, 1 larva, Dau, Pampanga Prov. (Cowell, Ingal). One male, 6 females, 4 sets assoc. skins, Quezon City, Manila Prov. (de Guia, Bruce, Baisas). Six males, 26 females, Camp Nichols, Rizal Prov. (Carraway, Callon, Sinclair). Five females, Camp Stotsenberg, Pampanga Prov. Mindanao: 1 larva, San Ramon, City of Zamboanga Prov. (Knight, Laffoon.) One female, Camp Gregg, Pangasinan. Pettit Barracks, Zamboanga, City of Zamboanga Prov. (Visaya.) C.A.S. Mindoro: San Jose (Ross).

Unknown outside the Philippines.

DISCUSSION: As pointed out by Bohart (1945: 63) this species has been confused by various authors with *niveoscutellum* (Theobald) and *alboscutellatus* (Theobald). However, it is separable from the first on details of male terminalia and from the second on the characters given in the key.

Aedes (Aedimorphus) alboscutellatus (Theobald)

Figs. 3, 4

1905. *Lepidotomyia alboscutellata* Theobald, Mus. Nat. Hungarici Ann. 3: 80 (2 females). Type locality: New Guinea. Simbang, Huon Gulf and Friedrich-Wilhelmshafen (Biro). Type: Females (cotypes) in Hungarian National Museum, Budapest.

1907. *Reedomyia alboscutella* Theobald. Theobald, Mon. Cul. 4: 261. Different combination, and lapsus.

1909. *Culex argentinotus* Banks, Philippine Jour. Sci. 4: 547 (male, female). Type locality: Philippines. Pinagsalaan well, Taytay, Rizal Province, Luzon (Banks). Type: Male, female (cotypes) in Bureau of Science, Manila. Probably nonexistent since World War II.

1921. *Aëdes ōmurensis* Yamada, Annot. Zool. Jap. 10: 73 (males, females). Type locality: Japan. Ōmura, Kiushu (Yamada). Type: 2 males, 4 females (cotypes) in Institute for Infectious Diseases, Tokyo.

1922. *Aëdes (Ecculex) alboscutellatus* Theo. Edwards, Bul. Ent. Res. 13: 101. Synonymy of *ōmurensis.*

1922. *Aedes (Ecculex) alboscutellatus*, Theobald. Edwards, Indian Jour. Med. Res. 10: 467. Synonymy of *argentinotus.*

Adult described by Barraud (1934: 250) and the larva by Penn (1949: 1).

ADULT: *Male.* Similar to *pampangensis* but differs as follows. *Head:* Proboscis all dark, or with a paler band-like area just beyond the middle, this may be obsolete (except ventrally). Palpi longer than proboscis by slightly more than length of apical segment. *Thorax:* Scutum marked on either side with two small clusters of yellow scales, one on anterior margin and the other on a line with the first and on a level with the scutal angle, a variable amount of yellowish scales may be scattered over the scutum. Scutellum with areas between the lobes free of scales. *Apn* with a few broad silvery scales; *ppn* bare. Propleuron, upper sternopleuron, lower posterior sternopleuron, and upper mesepimeron each with small patch of broad silvery-white scales; a few narrow yellowish scales on the subspira-

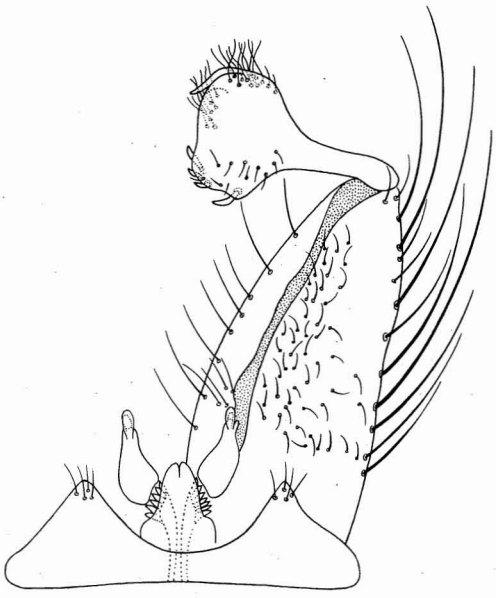

FIG. 3. *A.* (*Aedimorphus*) *alboscutellatus*. Male terminalia (Palawan).

cular area. *Legs:* Femora and tibiae each with apical patch of silvery-white scales anteriorly (that on tibiae is largely dorsal); fore and mid tibiae dark, some pale scaling posteriorly; hind tibia dark posteriorly. *Wing:* Wing with spot of silvery-white scales at base of costal vein. *Abdomen:* Tergite I with lateral band of silvery-white scales; III–VII with basal bands of brownish-yellow scales, VIII largely pale-scaled. Sternites with brownish-yellow scales basally, brown scales apically; VIII covered with silvery-white scales (since this sternite is dorsal on most specimens taken, it creates a very distinctive dorsal abdominal marking), not possessing distinctive hair tufts. *Terminalia:* Basistyle without lobes; tergal surface with numerous very small setae, these not extending to lateral margin setae along distal portion; sternal surface with a regular longitudinal row of very long hairs near to mesal margin. Dististyle distinctively shaped as figured. Ninth tergite strongly concave medially.

Female. Differs from the male mainly as follows. Proboscis dark. Vertex with dorsum narrow-scaled, a median anterior diamond-shaped group of these dusky, the remainder golden; the lateral broad-scaled area creamy-yellow except for dark patch at dorsal margin and sometimes one on a level with *apn*. *Apn* with a few narrow yellowish scales; *ppn* with a few dark narrow scales dorsally. Subspiracular area with a few dusky hairs. Tergites with a basolateral patch of silvery-white scales, the basal bands (which are variable in occurrence and width) either separate from these, or only narrowly connected. Sternites largely covered with brownish-yellow scales, some apical dusky scales usually present.

LARVA: Similar to *pampangensis*, but differing chiefly as follows. Spicules on antennal shaft sparser and not as heavily developed; antennal hair tuft with 5–13 branches. Head hair 5 with 3–4 branches; hair 6 with 3. Mentum with 16–18 lateral teeth. Comb with 20–26 scales in a patch, the scales blunt, fringed laterally and apically and without an enlarged central spine. Siphon index 3.5–3.9, acus large; 18–21 pecten teeth, all with 1–3 ventral denticles, the distal 1–2 teeth more

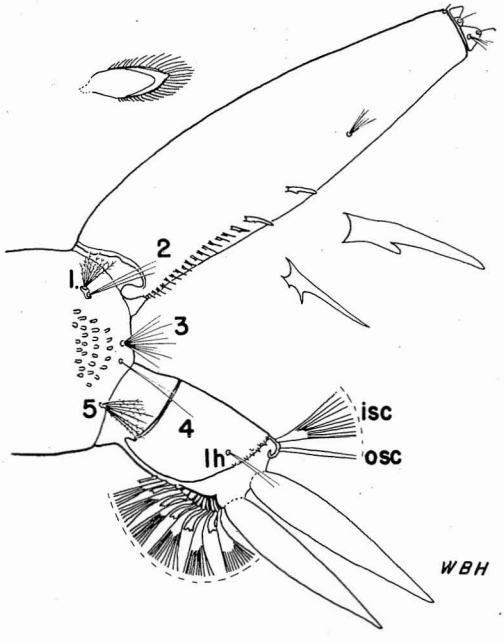

FIG. 4. *A.* (*Aedimorphus*) *alboscutellatus*. Larval terminal segments (Mindoro).

widely spaced. Only 1–2 tufts of ventral brush off the barred area basally.

BIONOMICS: The adults were collected while attempting to bite humans and on several occasions were netted in densely shaded woods. Also, females were taken from a carabao-baited trap. Edwards (1928*a:* 53) reported females taken at a light in Malaya. The larvae were taken on one occasion from road ruts through a coconut grove. Penn (1949: 245) found a larval collection on Mindoro in a shaded permanent ditch in which the water was clear, stagnant, and with a *p*H of 6.5. Leicester (1908: 132) collected the larvae from jungle pools in Malaya.

DISTRIBUTION: *Specimens examined.* U.S. N.M. Samar: 1 female, Osmena (Rozeboom, Zolik). Males, females, San Antonio (Paullus). Palawan: 14 males, 3 females, Bacungan (Laffoon). Seven females, Puerto Princesa (Johnson, Laffoon). Mindanao: 1 male, 2 females, Zamboanga, City of Zamboanga Prov. (Johnson, Laffoon, Knight). One male, Mercedes, Zamboanga Prov. (Laffoon, Knight). Jinamoc Island (between Samar and Leyte) (Medler). C.A.S. Mindoro: 2 larvae, San Jose (Ross).

Literature records. Luzon: Los Banos, Laguna Prov. (Bohart, 1945: 62). Mindoro: Caminawit Point (Penn, 1949: 1). Calapan (Edwards, 1929: 5).

Outside the Philippines, this species has been reported from the Solomon Islands, Admiralty Islands, New Guinea, northern Australia, Duke of York Island, Sumatra, Java, Ceram, Borneo, Malaya, India, Assam, Burma, and Japan.

Aedes (Aedimorphus) mindoroensis Knight and Hull

1929. *A.* (*Aed*) *lowisi* Theo. Edwards, Notulae Ent. 9: 5.

1934. *Aëdes* (*Aëdimorphus*) sp. Edwards, footnote, in Barraud, Fauna Brit. India, Dipt. 5: 250. Called attention to the fact that material named as *lowisi* by Edwards (1929: 5) in actuality represented another species.

1951. *Aedes* (*Aedimorphus*) *mindoroensis* Knight and Hull, Pacific Sci. 5: 199 (1 male, 4 females). Type locality: Philippines. Calapan, Mindoro Island. Type: Male (holotype) in B.M.† Terminalia separated.

DISTRIBUTION: *Specimens examined.* Type series. Mindoro: Calapan.

DISCUSSION: *A. mindoroensis* is most closely related to *lowisi*, a species that is known only from the Andaman Islands and from Morotai in the Moluccas. Externally, the adult of *lowisi* is indistinguishable from that of *mindoroensis.* However, the male genitalia of *lowisi* differs in having the narrow basal portion of the dististyle equal to no more than half the total length and in being evenly slender instead of rather broadly tapered, in having the short tergal setae in a rather narrow band along the mesal margin, and in lacking any special arrangement of the sternal setae of the basistyle. Because of the nature of the similarities between these species, it seems likely that a single polytypic species is concerned. However, much more material must become available before this can be determined definitely.

This species may be distinguished from the other members of Group C occurring in the Philippines by its banded tarsi.

Aedes (Aedimorphus) punctifemore (Ludlow)

Fig. 5

1921. *Stegomyia punctifemore* Ludlow, Military Surgeon 49: 690 (1 female). Type locality: Philippines. Fort Wm. McKinley, Rizal Prov., Luzon. Type: Female (holotype) in U.S.N.M.†

Male described by Dyar (1925: 217) and the female by Edwards, in Barraud (1934: 443).

ADULT: Scutum with several small spots of broad silvery scales. Tarsi all dark.

Male. A poor terminalia mount in the U. S. National Museum is the only existing spec-

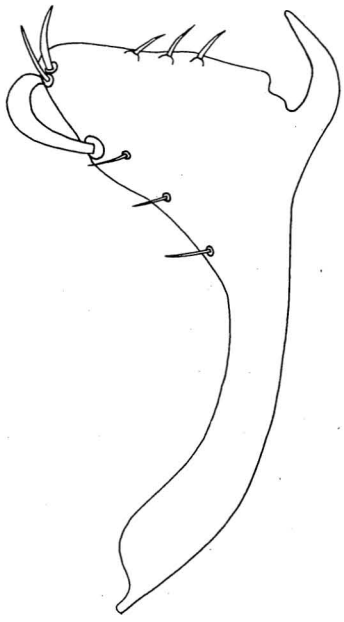

FIG. 5. *A.* (*Aedimorphus*) *punctifemore*. Dististyle of male terminalia (Luzon).

imen at present known of the male of this species. Figure 5 illustrates the dististyle of this specimen.

Female. Wing length about 3.5 mm. Proboscis dark, paler beneath. Palpus about one-sixth as long as the proboscis, dark. Torus with broad silvery scales medially. Vertex with some broad dark scales medially, narrow white scales medially on nape, maybe a few medial dark narrow scales, and in the type these latter scales extend to the eyes; remainder of dorsum and all of lateral surface broad-scaled, pale except for two dark-scaled areas; some dark upright-forked scales on nape. *Thorax:* Integument dark. Scutum with fine reddish-black scales, 2 pairs of small silvery broad-scaled spots on disc of scutum, a small patch of similar scales above wing base, one on either side of prescutellar space and one on prescutellar space. Scutellum with broad white scales on each lobe. *Apn* with some broad white scales; *ppn* with narrow dark ones above, some white broad scales below. Following pleural areas each with a patch of small white broad scales: propleural, subspiracular (2 patches), paratergite, dorsosternopleural, lower posterior sternopleural, and mesepimeral. *Legs:* Femora and tibiae anteriorly dark, with silvery anterior knee spots and with scattered broad translucent silvery scales present. Tarsi dark. *Wings:* Dark, a small white spot basally on costa. Halter knob dark. *Abdomen:* Tergites dark, basolateral white spots present.

LARVA: Unknown.

BIONOMICS: Unknown except that females were taken in a carabao-baited trap on Samar.

DISTRIBUTION: *Specimens examined.* R.K.L. Samar: Numerous females, Osmena. U. S. N.M. Luzon: 1 male terminalia, 15 females, Camp Nichols, Rizal Prov. (Carraway.) Female type, Ft. Wm. McKinley, Rizal Prov.

Outside the Philippines, known only from Bihar, India.

Aedes (Aedimorphus) vexans nocturnus (Theobald)

Figs. 6, 7

1903. *Culex nocturnus* Theobald, Mon. Cul. 3: 159 (females). Type locality: Fiji (Hall). Type: 2 females (cotypes) in B.M.†

1913. *Culex nocturnus niger* Theobald, Nova Caledonia 1: 164 (1 specimen). Type locality: New Caledonia. Canala (Sarasin and Roux). Type: Sex unknown; in Bale Museum.

1946. *Aedes* (*Aedimorphus*) *vexans nocturnus* (Theobald). Bohart and Ingram, Mosq. Okinawa and Islands in Central Pacific, NavMed. 1055, p. 15.

ADULT: Vertex dorsum and scutellum narrow-scaled. Scutum with bronzy-brown, yellow, and whitish scales intermixed. Hind tarsi with basal bands on all segments.

Male. Wing length 3.0–3.4 mm. *Head:* Proboscis dark, a poorly defined broad paler area near the middle. Palpus longer than proboscis by about length of last segment; II–IV with basal white bands; numerous long hairs arising apically on III and laterally along IV–V

(these two segments being down-tilted). Torus bare. Vertex dorsum covered with narrow and narrow-curved pale scales and dusky and pale upright-forked scales, lateral portion covered with broad pale scales, sometimes an anterior spot of dusky broad scales at the margin of the narrow-scaled area. *Thorax:* Scutum covered with an indefinite pattern of narrow bronzy-brown, yellow, and whitish scales. Scutellum with pale narrow scales. *Apn* and *ppn* with narrow and narrow-curved scales, pale (the dorsal scales on *ppn* are frequently brownish, however). The following pleural areas each with a patch of broad pale scales: propleural, subspiracular (2 patches), postspiracular, paratergite, dorsal sternopleural, medio-posterior sternopleural, and mesepimeral; usually a very few scales on the prealar knob, particularly in female. *Legs:* Femora speckled with pale scales anteriorly, knee spots present. Tibiae may have some scattered pale scales anteriorly, apical pale scaling present on fore and hind, basal pale scaling present at least ventrally on all the tibiae. Fore and mid-tarsi with first two or three segments with basal pale bands (may be none on I of fore tarsus). Hind tarsi with basal pale bands on I–V. Fore and mid-tarsal claws unequal, each unidentate; hind claws equal, simple. *Wings:* Dark-scaled, a small basal spot of pale scales may be present on the costa. *Abdomen:* Tergite I with a lateral band of pale scales, II–VII with basal bands, those on the more posterior segments prolonged laterally. Sternites largely pale-scaled, dark scaling may be present medially. *Terminalia:* Basistyle with a basal setose plaque on mesal membranous surface; a rather regular longitudinal row of stout bristles on the sternal surface near the mesal margin. Dististyle with appendage distinctly subapical. Ninth tergite concave medially.

Female. Length of wing about 3.5 mm. Torus with a patch of pale scales medially. Differs from male chiefly as follows: Palpus approximately one-fifth as long as the proboscis, apex pale-scaled, may be a few pale scales medially. Proboscis with pale area larger and more pronounced. Mid-tarsus with basal pale bands on I–IV, I with some pale scales medially. Tarsal claws equal, fore and mid each unidentate, the hind simple. One or more of tergites IV–VII with apical pale scaling, I–VII with lateral pale bands that are separate from the basal bands. Wing as in male, or sometimes possessing considerable pale scaling along costa and subcosta and even some pale scales on vein 1.

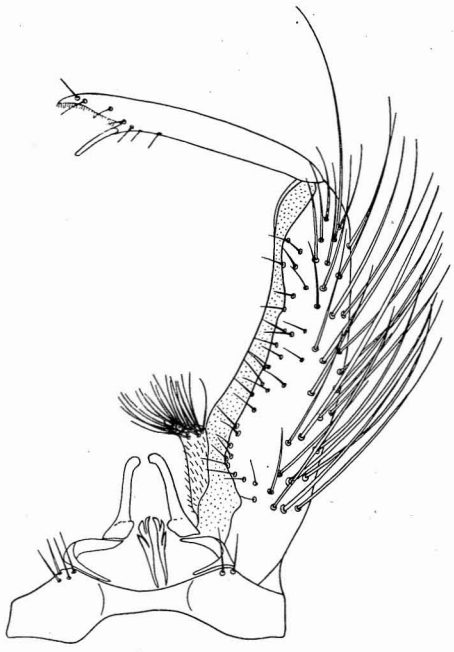

FIG. 6. *A. (Aedimorphus) vexans nocturnus.* Male terminalia (Samar).

LARVA: *Head:* Antenna spiculated, tapering slightly from base to apex; antennal hair tuft with 6–10 branches, inserted at about basal one-third. Mouth brushes with comb-like tips. Hair 4 very small, with 2–6 branches; 5 single or double (rarely triple); 6 single (sometimes double); 7 with 5–12; 8 single; 9 with 1–3; 12 with 5–10; 13 with 1–3; 14 with 1–3; 15 with 3–8; 17 and 18 single, 18 occasionally forked; 20 with 3–8. Mentum with 11–16 lateral teeth. *Thorax:* Prothoracic hairs 1 and 2 single; 3 with 2–4 branches. Mesothoracic hair 9 with 5–9 branches; 10 and

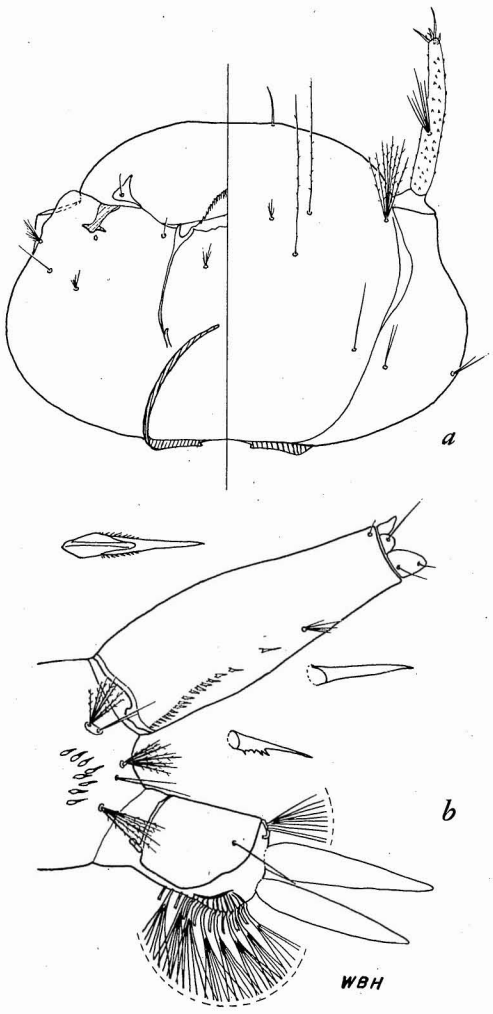

FIG. 7. *A. (Aedimorphus) vexans nocturnus.* Larva (Samar). *a*, Head; *b*, terminal segments.

12 single, stout; hair 11 very small, with 1–3; a short acutely tapered spine at base of tubercle. Metathoracic hair 9 with 4–6 branches; 10 single, stout; 12 single, much reduced; 11 very small, with 1–5. *Abdomen:* Dorsolateral hair on I with 3–8 branches; on II with 3–6. Lateral hairs on I and II with 2–4; on III–V with 1–4; on VI with 1–3. Pentad hair 1 with 5–11 branches; 2 and 4 with 1–3; 3 with 5–9; 5 with 6–10. Comb with 8–10 teeth, long, acutely tapered, with attached portion oval in shape and fringed laterally. Siphon smooth with a narrowly attached acus, index 2.1–3.2; 13–19 pecten teeth in a row, the distal two more widely separated, each tooth except the distal two or three with 1–3 ventral denticles; siphon hair tuft with 3–7 branches. Anal plate incomplete, smooth, with an attached acus; *lh* small, single or double; *isc* with 6–9 branches, *osc* single; ventral brush of 16 (rarely 15–18) tufts with 3 or 4 off the barred area basally, elements of barred area joined laterally by a bar, tufts of ventral brush with 4–11 branches. Anal gills subequal, narrow and gradually tapering to apex, or broad at base and rapidly tapering to apex; 1.7 to 2.4 times longer than anal plate.

BIONOMICS: The adults were commonly collected while trying to bite humans at night, and from a light trap. The larvae were frequently encountered in temporary rain-filled ground pools and depressions of all types, but principally from those in grassy areas.

DISTRIBUTION: *Specimens examined.* R.K.L. Luzon: Olongapo, Subic Bay, Zambales Prov. (Rozeboom, Zolik, McMillan). Samar: Osmena (Laffoon, Rozeboom). Palawan: Iwahig Penal Colony, Puerto Princesa, Bacungan, Tacburos, and Balsahen River (Johnson, Laffoon, Fitzgerald). Mindanao: Zamboanga and San Ramon (Johnson, Knight, Laffoon). C. C. Luzon: Sison, Pangasinan Prov. (Franclemont). Baisas Coll. Luzon: Tunkong Manga, Bulacan Prov. Colo. State U. Coll. Mindoro: San Jose. (Howe.)

Literature records. Mindoro: Caminawit Point (Penn, 1948: 245). Tunkulan (Edwards, 1929: 5). Luzon: Manila (Edwards, 1929: 5).

Outside the Philippines, this subspecies is known from Samoa, Tonga, Fiji, New Hebrides, New Caledonia, Australia, New Guinea, Marshalls, Marianas, and Netherlands Indies.

DISCUSSION: Bohart and Ingram (1946: 15) resurrected the name *nocturnus* for the *vexans* of the Australasian region and of the Philippines. They consider the material known to date from these areas to be subspecifically

distinct on the basis of larval head hairs 5 and 6, which are single to triple and single, respectively. Typical *vexans* larvae have these hairs with 3–5 and 2–4 branches (the latter occasionally single). Philippine larvae seen by us have hair 5 single or double (rarely triple) and 6 single (sometimes double). Consequently, the name *nocturnus* is employed in this paper. Larvae from Europe (Edwards, in Barraud, 1934: 253), Japan (La Casse and Yamaguti, 1948: 102), and the United States (Carpenter, Middlekauff, and Chamberlain, 1946: 232) have the hair branching given above for typical *vexans*.

The two cotype females of *nocturnus* were compared in the British Museum with the types (all females) of *eruthrosops* Theobald (Ceylon), *minuta* Theobald (India), and *nipponii* Theobald (Japan). The only difference noted was that in *nocturnus* the wings are dark except for a small basal patch of pale scales on the costa. In the other three types, the wings possess a variable amount of scattered pale scaling along the costa (as is frequently the case in Philippine material).

Edwards (in Barraud, 1934: 253) gives evidence that indicates the probable occurrence of additional races or subspecies, but, until much more work is done on this subject, the status of the Philippine material cannot be further clarified.

Aedes (Aedimorphus) ostentatio
(Leicester)

1908. *Aioretomyia Ostentatio* Leicester, Cul. Malaya, p. 193 (females). Type locality: Malaya. Pahang road (at 4½ miles) and Gombak road (at 5 miles), Kuala Lumpur (Leicester). Type: 2 females (cotypes) in B.M.†
1910. *Pseudohowardina chrysoscuta* Theobald, Mon. Cul. 5: 228 (female). Type locality: Ceylon. Peradeniya (Green). Type: Female (holotype) in B.M.†
1911. *Danielsea pagei* Ludlow, Psyche 18: 128 (7 females). Type locality: Philippines. Fort Pikit, Mindanao (Page). Type: 7 females (cotypes) in U.S.N.M.† One of these specimens here designated lectotype.
1913. *Ochlerotatus ostentatio* (Leicester). Edwards, Bul. Ent. Res. 4: 228. Synonymy of *chrysoscuta*.
1922. *Aedes ? ostentatio* Leic. Edwards, Indian Jour. Med. Res. 10: 468. Synonymy of *pagei*.
1925. *Aëdes* (*Aëdes*) *ostentatio* Leicester. Dyar and Shannon, Insecutor Inscitiae Menstruus 13: 78. Different combination.
1928. *Aedes* (*?Aedimorphus*) *ostentatio* (Leic.). Barraud, Indian Jour. Med. Res. 16: 374. Different combination.

Female described by Barraud (1934: 267).

ADULT: Vertex dorsum partially broad-scaled. Scutellum narrow-scaled. Scutum with narrow lines of yellow scaling. Tarsi all dark.

Male. Unknown.

Female. Wing length 3.6 mm. *Head:* Proboscis dark-scaled. Palpus only about one-sixth length of proboscis, dark-scaled. Torus ochreous, with a few fine dark scales and hairs medially. Vertex dorsum with broad dark scales, a line of narrow golden scales along eye margins and a patch of similar scales medially on nape (this narrowing a variable distance anteriorly, reaching anterior margin in some specimens), a patch of upright-forked dusky to golden-colored scales on nape; lateral portion with yellowish broad scales, a median patch of broad dark scales. *Thorax:* Scutum with narrow yellow scales along lateral (broken in region over paratergite) and anterior margins and along scutal angles, a narrow median longitudinal band of yellow scales that forks at the prescutellar area, remainder with dark narrow scales; acrostichal bristles absent, dorsocentral bristles present. Scutellar lobes with narrow yellow scales, sometimes a few median narrow dark scales on mid-lobe. *Apn* with a few dark scales above and a patch of narrow yellow scales below, *ppn* bare except for a sparse dorsal line of

narrow dark scaling. Each of the following pleural areas with a patch of broad pale scales: propleural, postspiracular (few or none), paratergite (few or none), dorsal sternopleural, ventroposterior sternopleural, and mesepimeral. *Legs:* Fore and mid-femora dark anteriorly, hind with anterior surface pale except for apical fourth and most of dorsal margin, a line of pale scales anteriorly on apex of hind and mid femur. Tibiae and tarsi dark. Tarsal claws equal, fore and mid unidentate, hind simple. *Wings:* Dark-scaled. Halter knob with dusky scaling. *Abdomen:* Tergites dorsally dark, basolateral pale scaling on I–VII, this visible dorsally on II–VI. Sternites III–VII with basal pale bands.

LARVA: Undescribed.

BIONOMICS: The single adult from Palawan was netted in a densely shaded area near a river. No larvae were found in the Philippines. Leicester (1908: 193) collected larvae from jungle pools in Malaya. Further, he reported the female to be a vicious daytime biter.

DISTRIBUTION: *Specimens examined.* R.K.L. Palawan: 1 female, Bacungan (Laffoon). C.A.S. Mindoro: 3 females, San Jose (Ross).

Literature records. Mindanao: Ft. Pikit (type series of *pagei*).

Outside the Philippines, reported from India, Ceylon, Malaya, Indo-China, Sumatra, Java, Borneo, and Ceram.

DISCUSSION: The Palawan female was compared with Leicester's two cotype females in the British Museum. It was found to agree sufficiently well to be considered conspecific.

Theobald's type female of *chrysoscuta* was examined and found to agree well with the Palawan specimen except that the pleurae are noticeably paler in color.

Aedes (Aedimorphus) wainwrighti
Baisas

1946. *Aedes* (*Aedimorphus*) *wainwrighti* Baisas, Philippine Mon. Bul. Bur. Health 22: 34 (1 female). Type locality: Philippines. Llavac, Infanta, Tayabas Prov. Luzon (Sunico). Type: Female (holotype) in Philippine Bureau of Science, Manila.

ADULT: A dark-brown species, with a broad median silvery line on anterior half of scutum, broad silvery scales on the paratergite, midscutellar lobe, and torus. Hind tarsi banded with white.

Male. Unknown.

Female. Modified from the original description. *Head:* Proboscis dark brown, nearly as long as fore femur. Palpus about one-sixth length of proboscis, dark brown. Torus dark brown, with a small patch of broad silvery scales medially. Vertex broad-scaled, a triangular silvery patch medially that broadens anteriorly and extends on either side as a short fine line along the eyes, laterad to this median area is a dark-scaled spot, the remainder of the dorsal surface and the entire lateral surface pale brownish (almost whitish under different lighting), a median area of narrow dark scales and a few upright-forked dark scales on the nape. *Thorax:* Integument brownish on scutum, darker on pleurae. Scutal scales narrow dark brown; a broad median silvery line on the anterior half of the scutum; a pair of dorsocentral bristles anteriorly and a stronger pair above level of wing bases, two pairs of prescutellars, rather few supra-alars. Scutellum with broad scales, silvery on mid-lobe except for a narrow dark line on posterior margin, dark on lateral lobes. *Apn* with a small patch of silvery flat scales; *ppn* without scales, 3 bristles present. Each of the following pleural areas with a patch of broad silvery scales: propleural, subspiracular, paratergite (covering entire area), upper sternopleural, mediposterior sternopleural, and upper mesepimeral. *Legs:* Dark brown. Femora pale basally and below, hind with basal half pale both anteriorly and posteriorly, mid and hind with a conspicuous silvery spot at apex. Fore and mid-tarsi with a basal white band on I, remainder dark. Hind tarsus with a basal white band on I, remainder missing. *Wings:* Dark.

Abdomen: Tergites dark dorsally, silvery lateral patches visible above on V–VII: lateral margin of I entirely silvery, of II–VII broadly white basally. Sternites II–VII basally pale, apically dark, segment VIII retractile and hidden in VII.

LARVA: Unknown.

BIONOMICS: The single known specimen was taken in a mosquito trap.

DISTRIBUTION: Known only from the single type specimen. Luzon: Llavac, Infanta, Tayabas Prov.

DISCUSSION: As Baisas pointed out in the type discussion, this species has a strong resemblance to members of Group E (*albolineatus*-group) of *Stegomyia* but is separable from them on the possession of paratergite scaling and in being brownish rather than black in general appearance.

In a footnote to the type description, Baisas stated that, subsequent to the preparation of the description, two males and several females of a closely similar species were received from Mt. Apo, Davao, Mindanao (Hoogstraal). In these, the hind tarsi had I with basal one-fifth white, II with the basal one-third white, III all white except for a narrow ring at apex, IV–V all dark (paler under certain lights). The male palpi were slender throughout, without hairs, and upturned apically. The male terminalia was that of an *Aedimorphus*.

Until the male terminalia of these species are available for study, it will not be definitely possible to place them, but from the available information it seems likely that they represent a separate group near Group A (*apico–annulatus*-group). This group is unusual in that the included species are all tree-hole breeders.

Subgenus BANKSINELLA Theobald

1907. *Banksinella* Theobald, Mon. Cul. 4: 468. Genotype: *luteolateralis* Theobald (Africa).

ADULT: Male palpi longer than proboscis by one-half or more of segment IV; segment V so reduced as to appear absent, segment IV strongly upturned, numerous ventrally directed long hairs arising apically on III and all along IV. Vertex dorsum and scutellum narrow-scaled. Dorsocentral and acrostichal bristles present (sparse and short). Paratergite bare. Lower mesepimeral bristles present or absent. Fore and mid-tarsal claws of male unequal, each unidentate; hind equal, unidentate or simple. Tarsal claws of female equal, each unidentate, hind simple in *lineatopennis*. *Terminalia:* Basistyle with a distinct basal lobe. Dististyle inserted subterminally, with or without articulated appendage. Claspettes absent. Mesosome divided into lateral plates, each of which are crenulated or toothed laterally.

LARVA: Similar to *Aedimorphus* in having the distal pecten teeth more widely spaced but differing in lacking an acus on the anal plate. Antennal hair tuft with 8–11 branches. Head hair 4 with 5–9 branches; 5 with 4–7; 6 with 3–6. Comb with 6–12 large teeth in an irregular row, each tooth with a sharp spine and basal fringe. Siphon with an attached acus; 12–24 pecten teeth, each with 1 or 2 strong basal denticles except for the distal 2–3 which may be simple, these latter more widely spaced. Anal plate complete, or narrowly incomplete; ventral brush of 12–16 tufts, basal 3–7 tufts off the barred area. Habitat chiefly rain-filled temporary pools.

DISTRIBUTION: Two species, *brugi* Edwards and *imprimens* Walker, are Australasian, with the latter also occurring in the Philippines. One species, *lineatopennis* (Ludlow), extends from the Ethiopian region into the Australasian and Oriental regions. The remaining species are Ethiopian.

SYSTEMATICS: Closely related to the subgenus *Aedimorphus*, differing most markedly in the structure of the male palpi.

Aedes (Banksinella) imprimens (Walker)

Figs. 8, 9

1861. *Culex imprimens* Walker, Linn. Soc. Lon-

don, Proc. 5: 144. 1860 (female). Type locality: Amboina (Wallace). Type: Female (holotype) in B.M.† Identified as type by E. A. Waterhouse.

1901. *Culex imprimiens*, Walker. Theobald, Mon. Cul. 1: 422. Lapsus.

1908. *Culex Auratus* Leicester (nec Grabham, 1906), Cul. Malaya, p. 153 (female). Type locality: Malaya. Type: No information. Not in B.M.

1913. *Ochlerotatus imprimens* (Walker). Edwards, Bul. Ent. Res. 4: 228. In part. Questioned synonymy of *auratus* (no material seen). Different combination.

1946. *Aedes* (*Banksinella*) *imprimens* (Walker). Hsiao and Bohart, Mosq. Japan, Nav-Med 1095, p. 22. Different combination.

Larva is described by Bohart (1945: 63); systematics treated by Edwards, in Barraud (1934: 257) and Hsiao and Bohart (1946: 22).

ADULT: A large yellowish-brown species. Hind tarsal segments all basally banded.

Male. Wing length about 5.0 mm. *Head:* Proboscis dark-scaled. Palpus longer than proboscis by over one-half length of terminal long segment, dark-scaled. Torus bare. Vertex dorsum with narrow golden scales, dark upright-forked scales posteriorly and pale ones anteriorly; lateral portion of vertex with broad pale scales. *Thorax:* Scutum brown, rather thinly covered with hair-like brownish-gold scales, paler over wing bases, and on prescutellar area. All scutellar lobes with narrow yellow scales. *Apn* with broadened and narrow yellow scales; *ppn* with narrow yellow scales. Each of the following pleural areas with a patch of broadened whitish scales: subspiracular, dorsal sternopleural, ventroposterior sternopleural, and mesepimeral (pin through postspiracular area). *Legs:* Fore and mid-femora dark anteriorly, some scattered pale scales ventrally, and pale scales at apices; hind femur pale-scaled anteriorly except for a dark apical area, dark scales on dorsal surface, a ring of pale scales on extreme apex anteriorly. Tibiae dark. Fore tarsi dark except for a few pale scales basally on II; mid-tarsi with narrow basal pale bands on I–II; hind tarsi with narrow basal pale bands on I–V, broadest on I and narrower on each succeeding segment. Fore and mid-tarsal claws unequal, each unidentate; hind tarsal claws equal, each unidentate. *Wings:* Dark-scaled, wing membrane with a pronounced yellowish iridescence. Halter knob dark. *Abdomen:* Tergites dark, lateral margin of I with a band of pale scales, III–VII with narrow basal ochreous bands. Sternites pale-scaled, an apical line of dark scales on most of them. *Terminalia:* Drawing and description from a New Guinea specimen. Basistyle short, broad; a prominent subbasal lobe present, this bearing numerous very stout setae. Dististyle broad, deeply divided apically into a pair of unequal arms, the shorter of these bearing several setae. Ninth tergite broadly divided medially.

FIG. 8. *A.* (*Banksinella*) *imprimens* (Dutch New Guinea). Male terminalia (Dutch New Guinea). Paraproct omitted on right.

Female. Similar to the male but differing as follows. Palpus approximately one-fifth as long as proboscis, dark. Torus with a few dark hairs and scales medially. Vertex with a medioanterior area of dark narrow scales and with a patch of broad dark scales at lateral margin of dorsal narrow-scaled area. Scutum with a

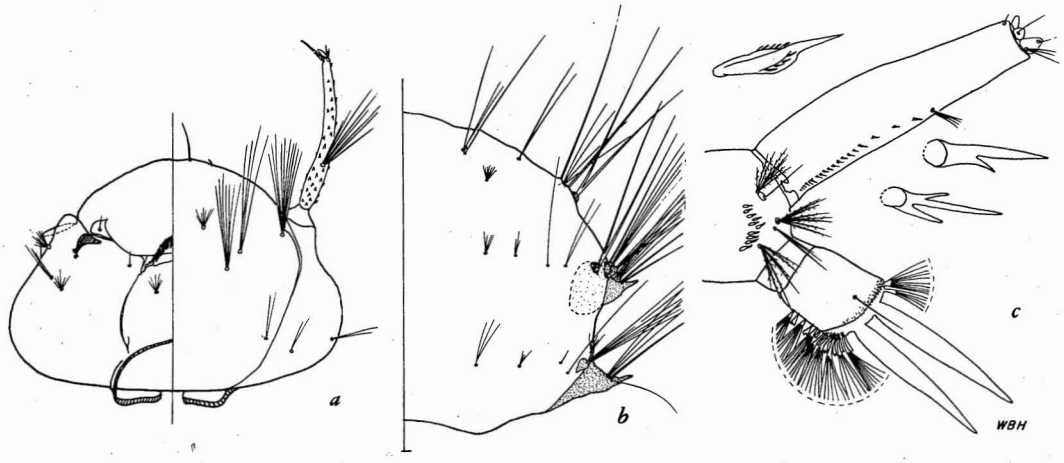

FIG. 9. *A.* (*Banksinella*) *imprimens.* Larva (Dutch New Guinea). *a*, Head; *b*, thorax, dorsal aspect; *c*, terminal segments.

variegated pattern of blackish-brown and golden scales. *Ppn* with some dark scales interspersed dorsoanteriorly. Propleuron and postspiracular area also each with a scale patch. Fore and mid-tarsi with small basal white patches on I–III, hind tarsi as in male. Tarsal claws equal, unidentate. Base of costa with a few pale scales. Tergites II–V with basal ochreous bands, a dorsobasal median pale patch on VI, nearly complete lateral ochreous bands on I–VII.

LARVA: Description based on a whole larva from Toem (E. S. Ross), and a larval skin from Hollandia, both of Dutch New Guinea, and a whole larva and larval skin from Bougainville, Solomon Is. (A. B. Gurney), all of which are in the U.S.N.M. No larval specimens from P. I. available. *Head:* Integument with a fine droplet-like rugosity. Antenna largest at base and tapering slightly toward apex, with prominent spicules over most of length; antennal hair tuft with 8–11 branches. Hair 4 with 7–9 branches; 5 with 4–7; 6 with 3–5; 7 with 9–13; 8 double (once single); 9 with 2–3; 12 with 8–10; 13 and 14 with 2–3; 15 with 5–8; 17 and 18 single (rarely forked at tip); 20 with 5–9. Mentum with 20–24 lateral teeth. *Thorax:* Meso- and metathoracic 9–12 hair groups arising from large heavily sclerotized tubercles, each tubercle also bearing a strong blunt spine; mesothoracic hair 9 with 6–7 branches. *Abdomen:* Dorsolateral hair on I with 3–6 branches; on II with 4–5. Lateral hair on I with 2–3; on II with 4–6; on III with 5; on IV–VI with 2–4. Pentad hair 1 with 7–13 branches; 2 with 1–2; 3 with 6–11; 4 with 2–3; 5 with 5–11. Comb with 10–12 teeth in an irregular row, each tooth large with a sharp spine and lateral fringe on the attached portion. Siphon brown, acus attached, index 3.2–3.5; 19–24 pecten teeth, each with 1–2 strong basal denticles except the distal 2–3 which are simple, these latter teeth more widely spaced; siphon hair tuft moderate, with 4–7 branches. Anal plate complete, with a number of short acutely tapered spicules along dorsolateral margin (one specimen also had a small round detached acus); *lh* single (once double), shorter than length of anal plate; *isc* with 7–11 branches; *osc* with 3–5 branches. Ventral brush of 16–17 tufts, basal 4–7 tufts off barred area and piercing anal plate, barred area not connected laterally. Anal gills (one specimen) subequal, dorsal pair 2.3 times longer than anal plate.

BIONOMICS: No specimens were collected by us in the Philippines. However, females were collected in New Guinea and the Solomons while attempting to bite humans. A single male was netted in deep jungle in New

Guinea. The females are vicious biters and are present in great numbers shortly after the beginning of isolated rainy periods. Gurney (Bohart, 1945: 63) collected larvae on Bougainville Island from shaded leafy woodland pools. Causey (1937: 413) reported larvae from a buffalo wallow in Siam. Dr. E. S. Ross has reported to us in personal correspondence that he collected the larvae on Mindoro in shaded temporary puddles.

DISTRIBUTION: *Specimens examined.* U.S. N.M. Palawan: 4 females, Puerto Princesa (McGregor). Mindanao: 1 female, Ft. Pikit (Spry).

Literature records. Mindanao: Port Banga (Edwards, 1929: 5).

Also, the above unpublished record from Dr. E. S. Ross of San Jose, Mindoro.

Outside the Philippines reported from Japan, Siam, ? Malaya, Sumatra, Java, Borneo, Ceram, Amboina, New Britain, New Guinea, and the Solomons.

DISCUSSION: The type has been studied in detail. The head and hind tarsal segments III–V are completely missing, and the scutum is rather badly rubbed. The remainder of the specimen is in sufficiently good condition to make out all the characters. A female specimen from Cyclops Mts., Hollandia, Dutch New Guinea (Laffoon) in the Knight collection was compared with the type and found to agree in all details. A male which was captured at the same time as this female, and which agrees very well with it, is believed to represent the male of *imprimens*. This pair of specimens was used for the above adult description. Three wild-captured females from Pavuvu, Russell Group (Downs) and one from Guadalcanal (Downs) in the Knight collection agree in all details with the New Guinea female.

The larva has not previously been described except for some brief notes by Bohart (1945: 63) from larvae taken on Bougainville Island, Solomons (Gurney).

Apparently, no authentic material of *auratus* Leicester exists, but based on Leicester's description (female only) this species agrees very well with the description of *imprimens* given above.

The Dutch New Guinea male specimen referred to previously was compared to the type (male) of *A.* (*B.*) *brugi* Edwards in the British Museum. The two were found identical in all details, including terminalia, except that the *brugi* specimen was distinctly smaller (wing length described as 3.8 mm. in original description). This is also true of a single male in the Knight collection that was reared from larvae collected in a road rut at Lake Sentani, Hollandia, Dutch New Guinea. This specimen was also compared to the type of *brugi* and found to agree perfectly. It is believed that *brugi* is a synonym of *imprimens*, but, until evidence is forthcoming that the size difference is inconsequential, it is thought better to hold the two species separate.

Aedes (Banksinella) lineatopennis
(Ludlow)

Figs. 10, 11

1901. *Culex luteolateralis* Theobald (type male only), Mon. Cul. 2: 71 (males, females). Type locality: Africa. Durban, Natal (Christophers). Salisbury, Rhodesia (Marshall). Malaya. Straits Settlements, Perak (Wray). Type: Male (lectotype) in B.M.

1905. *Taeniorhynchus lineatopennis* Ludlow, Canad. Ent. 37: 133 (females). Type locality: Philippines. Camp Gregg, Bayambang, Pangasinan Prov. Luzon (Chamberlain). (However, the type label has "Camp Gregg, Angeles, Pampanga Province.") Type: 3 females (cotypes) in U.S.N.M.† The specimen bearing the locality label is here designated lectotype.

1913. *Pseudohowardina linealis* Taylor, Rpt. 1911, Austral. Inst. Trop. Med., p. 10 (female). Type locality: Australia. Ching Do and Townsville, Queensland. Type: No information.

1915. *Banksinella lineatopennis*, Ludlow. Edwards, Bul. Ent. Res. 5: 274. Different combination. Restricted *luteolateralis* to type female and applied *lineatopennis* to type male.

Adult and larvae described by Barraud (1934: 269).

ADULT: A small dark species readily recognized by the broad longitudinal lateral area of yellow scaling on the scutum.

Male. Wing length about 2.6 mm. *Head:* Proboscis dark. Palpus longer than proboscis by nearly the length of the terminal segment; dark. Vertex dorsum with a large central area of yellow narrow and upright-forked scales. *Thorax:* Scutum with a broad area of yellow scales along the lateral margin, central portion dark-scaled, some dark scales present beyond the yellow scales on the lateral margin over the spiracle; dorsocentral, acrostichal, and prescutellar bristles present. Mid-scutellar lobe with narrow yellow scales, sometimes a few dusky scales apically; lateral lobes essentially bare of scales. *Apn* bare of scales; *ppn* with a few narrow dark scales. Pleuron nearly bare of scales, a few usually being present on the propleuron, dorsally and medioposteriorly on the sternopleuron, and on the mesepimeron; 1–2 lower mesepimeral bristles present. *Legs:* All dark. Fore and mid-tarsal claws unequal, each unidentate; hind claws equal, simple. *Wings:* Dark, pale scales along vein 1 to junction with stem of vein 2 and along basal portion of vein 5. *Abdomen:* Tergite I dark-scaled dorsally; II–VII with dorsal basal pale bands. Sternites dark. *Terminalia:* Basistyle elongate; with numerous hairs along inner surface, a row of short peg-like setae interspersed among these apically; with a projecting basal lobe that bears several strong apical spines. Dististyle inserted before apex, prominently widened just beyond middle. Ninth tergite deeply concave medially.

Female. Differs from male chiefly as follows. Palpus approximately one-seventh as long as the proboscis. Scutum with dark scales laterad of the yellow-scaled band from the anterior margin to the level of the wing base. Lateral scutellar lobes with a few narrow yellow scales. Tarsal claws equal, unidentate on fore and midlegs, simple on hind. Some of the sternite scaling appearing paler. Wing with almost all of veins Sc and 5 pale-scaled also, some pale scales may be present basally on vein 4.

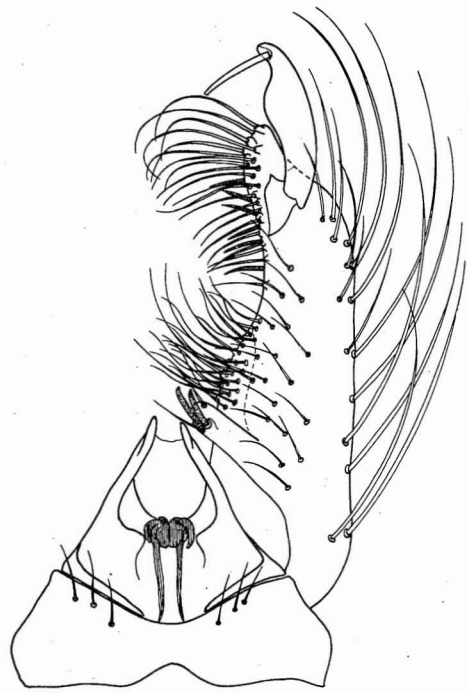

FIG. 10. *A. (Banksinella) lineatopennis*. Male terminalia (Samar).

LARVA: *Head:* Antenna stocky, broadest at base and tapering somewhat toward apex; prominent spicules over most of length; antennal hair tuft with 5–10 branches, inserted before middle. Mouth brushes with comb-like tips. Hair 4 small, with 5–9 branches; 5 with 4–7; 6 with 3–6; 7 with 8–13; 8 with 2–3; 9 with 1–5, usually 3–4; 12 with 4–7; 13 and 14 with 2–5; 15 with 5–10; 17 and 18 usually single, occasionally double; 20 with 6–10. Mentum with 17–20 lateral teeth. *Thorax:* Prothoracic hair 1 single or double; 2 stalked, with 1–3 branches; 3 stalked, with 2–5; the whole group small in size. Meso-

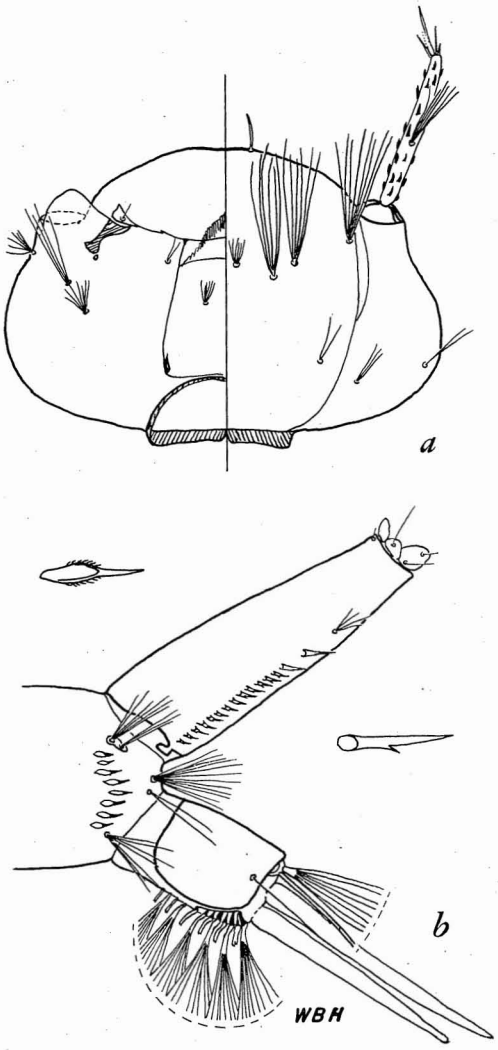

FIG. 11. *A. (Banksinella) lineatopennis.* Larva (Samar). *a*, Head; *b*, terminal segments.

thoracic hair 9 with 6–10 stout branches; 10 and 12 single, stout; 11 not seen. Metathoracic hair 9 with 3–4; 10 single; 12 much reduced, with 1–2; 11 not seen. *Abdomen:* Dorsolateral hairs on I and II with 2–4 branches. Lateral hair on I single or double; on II with 2–7; on III–VI single, rarely with 2–3. Pentad hair 1 with 4–8 branches; 2 and 4 with 2–3; 3 with 8–11; 5 with 4–9. Comb with 6–8 (usually 8) teeth, long, acutely tapering, attached portion oval with lateral fringe. Siphon smooth with a narrowly attached acus, index 2.1–2.5; 12–16 pecten teeth in a straight row, the distal two or three more widely spaced, the teeth usually with just one ventral denticle; siphon hair tuft with 2–7 branches, the tuft no longer than the distal pecten tooth. Anal plate incomplete, smooth; *lh* single or double; *isc* with 8–15, *osc* single; ventral brush of 12 tufts with 3–5 off the barred area basally, the tufts with 4–12 branches. Anal gills subequal, narrow, tapering to a slender point, 2.7–3.0 times longer than the anal plate.

BIONOMICS: The adults were taken in light traps. Nine larval collections were made, all in temporary, rain-filled, grassy ground depressions. According to Edwards (1941: 201), this species habitually feeds upon human blood.

DISTRIBUTION: *Specimens examined.* R.K.L. Luzon: Olongapo, Subic Bay, Zambales Prov. (Rozeboom, McMillan). Samar: Osmena (Laffoon, Rozeboom). Mindanao: Zamboanga, City of Zamboanga Prov. (Johnson, Knight, Laffoon). C. C. Luzon: Sison, Panagasinan Prov. (Franclemont). Baisas Coll. Luzon: Tunkong Manga, Bulacan Prov. U.S.N.M. Jinamoc Island (nr. Samar) (Medler). Mindanao: Males, females, Parang (Pallus). Pettit Barracks, Zamboanga (Visaya). Luzon: Males, females, Camp Nichols, Rizal Prov. (McDonald). Camp Stotsenberg, Pampanga Prov. S. Fernando, LaUnion Prov. (Shields.) Leyte: Males, females, Abuyog (Graham). One larva, Dulag (Starkey). C.A.S. Mindoro: San Jose (Ross).

Literature records. Luzon: Bayambang, Los Banos, Camp Nichols, Camp Stotsenberg (Bohart, 1945: 66). Mindoro: Calapan. Luzon: Manila (Edwards, 1929: 5).

Outside the Philippines this species is known from Africa, India, Ceylon, Andamans, Siam, Malaya, Sumatra, Java, Borneo, Celebes, Kabaena, Soemba, Timor, Amboina, and Queensland.

Subgenus AEDES Meigen s. str.

1818. *Aedes* Meigen, Syst. Beschr. 1: 13. Genotype: *cinereus* Meigen (Europe, North America).

ADULT: Dark brownish or reddish species with little or no ornamentation, tarsi all dark. Palpi short in both sexes. Vertex dorsum mostly broad-scaled. Scutellum narrow-scaled. Patches of broad white scales on propleuron, upper and posteromedian portions of sternopleuron, and on upper part of mesepimeron. Paratergite not scaled. Lower mesepimeral bristles absent but mesepimeron often with fine hairs posteriorly. Legs dark. Male with tarsal claws of fore leg unequal or equal, both toothed, midlegs with claws unequal or equal and with all combinations of being simple or toothed, hind legs equal and toothed or simple. Female tarsal claws equal, toothed, those on hind tarsi simple in some species. Tergite I with white scales along lateral border. *Terminalia:* Basistyle short, stout, no true basal lobe bearing various strikingly modified apical and subapical structures. Dististyle extremely various in form, sometimes bearing hairs but never with a true appendage present. Phallosome various but always divided into a pair of plates or rods. Claspettes absent. Various striking processes may be developed from the ninth or tenth segments. Female terminalia specifically modified.

LARVA: Similar to *Banksinella*. Antennal hair tuft single or branched (2–10). Head hair 4 with 2–7 branches; 5 single, or with 2–10; 6 single, or with 2–8. Comb with 8–14 scales arranged in regular or irregular row. Siphon with attached acus; distal pecten teeth usually more widely spaced. Anal plate incomplete; ventral brush with 10–15 tufts, all but basal 1–4 arising from a laterally connected barred area. Habitat a wide variety of fresh- and brackish-water ground pools, temporary or permanent.

DISTRIBUTION: Approximately 68 species are now recognized in the subgenus *Aedes*, of which the majority occur in the Australasian and Oriental regions. Thirteen species are known from the Philippines.

SYSTEMATICS: To date it has not been possible to divide the known species into any logical system of subgroups. For a detailed treatment of the known Philippine species, see Laffoon (1946).

Aedes (Aedes) robertsi Laffoon

1946. *Aedes* (*Aedes*) *robertsi* Laffoon, Jour. Wash. Acad. Sci. 36: 230 (males, females, larvae). Type locality: Philippines. Tacloban, Leyte (Roberts). Type: Male (holotype) in Academy of Natural Sciences of Philadelphia.

DISTRIBUTION: *Literature records.* Known only from type series.

Aedes (Aedes) hamistylus Laffoon

1946. *Aedes* (*Aedes*) *hamistylus* Laffoon, Jour. Wash. Acad. Sci. 36: 232 (males, females, pupae, larvae). Type locality: Philippines. Cape Melville, Balabac (Laffoon). Type: Male (holotype) in U.S.N.M.

DISTRIBUTION: *Literature records.* Known only from type series.

DISCUSSION: This species is apparently indistinguishable from *robertsi* except for the following characters. Male with claws of fore leg unequal, both toothed; claws of midleg unequal, the larger one simple, the smaller one toothed. Apical prolongation of basistyle more rounded than in *robertsi*, base of its inner posterior projection larger, with only a short blunt projection arising from it. Basistyle with two bristles close to outer base of prolongation, but with an area free of bristles for some distance anterior to these, a total of about 10 bristles on the basistyle. Female terminalia with the regions of densest sclerotization in the postatrial area differing. No means of separating the larva from that of *robertsi* has been found. The larvae of *robertsi* and of this species are unusual in that the

anal papillae are extremely long and possess prominent tracheation. This rather unusual structural detail is apparently correlated with their ability to remain nearly indefinitely at the bottom.

Aedes (Aedes) dux Dyar and Shannon

1925. *Aëdes (Aëdes) dux* Dyar and Shannon, Insecutor Inscitiae Menstruus 13: 81 (male). Type locality: Philippines. Type: Male (holotype) in U.S.N.M.
1928. *Aedes (Aedes) sigmoides* Barraud, Indian Jour. Med. Res. 16: 373 (female). Type locality: Andaman Islands. Port Blair (Christophers). Type: Female (holotype) in B. M.† Terminalia mounted.
1937. *Aedes (Aedes) dux* Dyar and Shannon. Causey, Amer. Jour. Hyg. 25: 414. Synonymy of *sigmoides*.
1945. *Aedes (Aedes) macrodixoa* Dyar and Shannon. Bohart, Synopsis of Philippine Mosq., NavMed 580, p. 65 and figure 52 (female only).

Adult and larva described by Laffoon (1946: 233).

DISTRIBUTION: *Specimens examined.* C.A.S, Mindoro: 2 females, 1 set assoc. skins, 1 larva. San Jose (Ross). C. C. Luzon: 19 females, Santo Tomas, LaUnion Prov. (Franclemont).

Literature records. Luzon: Camp Nichols and Las Pinas, Rizal Prov. Tungkong Manga, San Jose, Bulacan Prov. Manila, Manila Prov. Subic Bay, Zambales Prov. Camp Stotsenberg, Pampanga Prov. Mindoro: Caminawit Point. Mindanao: Zamboanga, City of Zamboanga Prov. (Laffoon, 1946: 235.)

Outside the Philippines this species is known from Java, Malaya, Siam, Andaman Islands, and Indo-China.

DISCUSSION: Laffoon (1946: 235) questioned the synonymy of *sigmoides* by Causey because Barraud's original description stated that the type had small, lateral, pale markings on the abdominal tergites. However, the senior author has had the opportunity of comparing Philippine specimens with the type of *sigmoides*, and there seems to be no doubt but that they are conspecific. Philippine specimens show paler brown areas basolaterally on some tergites, and in some specimens these areas even show a grayish color as does the type of *sigmoides*.

In general appearance *dux* most closely resembles *robertsi* and *hamistylus*. However, it may be readily distinguished from them because of the hind tarsal claws, which are simple in the former and toothed in the latter two.

Aedes (Aedes) johnsoni Laffoon

1946. *Aedes (Aedes) johnsoni* Laffoon, Jour. Wash. Acad. Sci. 36: 235 (males, females, pupae, larvae). Type locality: Philippines. Pasanonco, City of Zamboanga Prov., Mindanao (Johnson). Type: Male (holotype), with associated larval and pupal skins, in U.S.N.M.

DISTRIBUTION: *Literature records.* Known only from the type series. Leyte: Tanauan. Mindanao: Pasanonco, San Ramon, and Zamboanga Prov. Basilan: Isabela.

DISCUSSION: *Aedes johnsoni, margarsen, adustus,* and *andamanensis* (not recorded from the Philippines) make up a complex that is probably either polytypic or superspecific in form.

Aedes (Aedes) adustus Laffoon

1946. *Aedes (Aedes) adustus* Laffoon, Jour. Wash. Acad. Sci. 36: 236 (males, females). Type locality: Philippines. Cape Melville, Balabac Island (Howell). Type: Male (holotype) in U.S.N.M.

DISTRIBUTION: *Literature records.* Known only from the type series.

DISCUSSION: In the adult stage this species is very similar to *johnsoni* and *margarsen*, differing only in details of the male terminalia. The larva is undescribed.

A very unusual specimen was taken as a larva in the pool from which part of the type series of *adustus* was taken (Laffoon, 1946: 236). It is inseparable from the male of *adustus*

on external characters, but the terminalia are asymmetrical (Laffoon, 1946, fig. 14). One side is rather similar to *adustus*, while the other is very odd, showing some similarity to *campylostylus* and some to *adustus*. The larvae of *campylostylus*, *hamistylus*, and *uncus* were collected from this same pool. This specimen is in the U.S.N.M.

While at the British Museum in 1946, the senior author compared a Philippine male specimen of *adustus* with the holotype male of *andamanensis* Edwards and made a note to the effect that the two were conspecific. Word of this was sent to Laffoon, and, after reviewing the problem, he replied that he had used the figure given by Barraud (1934, fig. 71g) for his concept of the male terminalia of *andamanensis*. This figure shows three apical processes in addition to the tergal large one and is accordingly similar to *johnsoni* (differing, however, in the shape of the anterior fork elements of the dorsal large prolongation); and probably represents an undescribed species. No specimen that could have been used for this description was located in the collection of the B.M., so perhaps the specimen in question is still in the collection at Kasauli.

Barraud (1934: 290) recorded seeing specimens of *andamanensis* from the Andamans, Assam, E. Bengal, and the Malabar Coast. Four of Barraud's specimens from Assam are in the B.M., and an examination of the terminalia of a male in this series showed it to be unlike his figure and completely similar to the type of *andamanensis* in lacking the third of the three apical processes below the large tergal prolongation. Therefore, Barraud's figure must have been made from either E. Bengal or Malabar Coast specimens. However, the identity of his species must remain unknown until someone has the opportunity of re-examining his material that is still at Kasauli.

To return to the possibility of *adustus* being a synonym of *andamanensis*, Laffoon pointed out (in personal communication) that Edwards' (1922, fig. 37) original figure showed a series of short hairs along the tergal-lateral margin of the basistyle, whereas *adustus* possesses a group of about 10–15 long bristles tergal-laterally on the basistyle, and these are all arranged apically at the base of the tergal prolongation. No such group is shown in the figure given by Edwards. Other differences pointed out by Laffoon that might serve to separate the two species are the different shape of the anterior fork of the large apical prolongation of the basistyle and the different form of the group of stout spines on the inner basal surface of the basistyle. Unfortunately, Laffoon's letter did not arrive until after the departure of the senior author from the B.M., and these possible points of difference have not been checked. So, for the present, *adustus* has been maintained as a valid species.

Aedes (Aedes) margarsen Dyar and Shannon

1925. *Aëdes* (*Aëdes*) *margarsen* Dyar and Shannon, Insecutor Inscitiae Menstruus 13: 80 (males, females). Type locality: Philippines. Camp Eldridge, Laguna Prov., Luzon (Vasquez). Type: Male (lectotype) in U.S.N.M.

Adult and larva described by Laffoon (1946: 237).

DISTRIBUTION: *Literature records*. Luzon: Camp Eldridge, Los Banos, and Calamias, Laguna Prov. Tungkong Manga, San Jose, Bulacan Prov. Subic Bay, Zambales Prov. San Anastacio. Mindoro: San Jose. (Laffoon, 1946: 237.)

Unknown outside the Philippines.

DISCUSSION: The adult of this species is distinguishable from *andamanensis*, *johnsoni*, and *adustus* only in details of the male terminalia. The larva is apparently inseparable from the larva of *johnsoni*.

Aedes (Aedes) nubicolus Laffoon

1945. *Aedes* (*Aedes*) *uncus* (Theobald). Bohart, Syn. Philippine Mosq., NavMed 580, p. 66 and fig. 50. Male only.

1946. *Aedes* (*Aedes*) *nubicolus* Laffoon, Jour. Wash. Acad. Sci. 36: 237 (2 males). Type locality: Philippines, Sibulan River, at 7,000–8,000 feet on Mount Apo, Cotabato Prov., Mindanao (Clagg). Type: Male (holotype) in Museum of Comparative Zoology, Cambridge, Mass.

DISTRIBUTION: *Literature records.* Known only from the type series.

DISCUSSION: This species, which is known only from the male, is apparently indistinguishable externally from *macrodixoa* and *uncus*. However, the male terminalia is distinct from that of all species known.

Aedes (Aedes) uncus (Theobald)

1901. *Culex uncus* Theobald, Mon. Cul. 2: 53 (2 females). Type locality: Malaya. Klang, Selangor (Butler). Type: 2 females (cotypes) in B.M.† Terminalia mounted. These two specimens are not conspecific. Therefore, at this time the name *uncus* is restricted to the specimen bearing the following penciled label: "Klang. Among plantains." The other female, labeled "Klang jungle. IX.99" in ink on the back of the card supporting the pin, is an unnamed species.

1908. *Aioretomyia Varietas* Leicester, Cul. Malaya, p. 185 (1 male, 2 females in type series). Type locality: Malaya. Kuala Lumpur (Leicester). Type: 1 male, 2 females (cotypes) in B.M.† Both male and female terminalia mounted. The two females are conspecific with *uncus* (new synonymy). The male is a distinct species, and at this time the name *varietas* is restricted to this male specimen.

Adult described by Laffoon (1946: 237).

DISTRIBUTION: *Literature records.* Culion. Palawan: Puerto Princesa. Irahuan River Valley. Balabac Island: Cape Melville. (Laffoon, 1946: 238.)

Known outside the Philippines only from Malaya.

The Mt. Apo, Mindanao, record of Bohart (1945: 66) was based upon the type specimens of *nubicolus*.

DISCUSSION: The two specimens (Edwards, 1917: 223, stated that there was only a single type specimen) used by Theobald in describing this species have been examined by the senior author and found not to be conspecific. As pointed out in the synoptic table above, the specimen bearing the label "Klang. Among plantains." has been selected as the type for *uncus*. The other specimen apparently represents an undescribed species or at least one in which the female stage is unknown.

The specimen selected as type has a rather poor terminalic mount, but it was possible to see all of the structures except the preatrial sclerite and the preatrial plate. In all details seen, the terminalia compared well with a female terminalia of what has been considered to be *uncus* in the Philippines by Laffoon (1946: 237). However, externally this type specimen differs slightly, as follows: only 7–9 hairs on the anterior part of the sternopleuron, and about 20 fine hairs scattered all along the posterior margin of the sternopleuron. This difference in the number of hairs on the anterior portion of the sternopleuron is sufficient to keep this specimen from keying to *uncus* in the key to the Philippine species of the subgenus *Aedes* prepared by Laffoon (1946: 229).

The other female type specimen differs completely from *uncus* as treated here in lacking anterior sternopleural hairs altogether and in having only up to 4 hairs on the mesepimeron below the dorsal hair tuft (these occur posterior to the scale patch). The terminalia of this specimen resembles that of *campylostylus* except that there are apparently no postatrial hairs. However, the slide is very faded, and it was only possible to say that it was not *uncus* as figured by Laffoon (1946, fig. 21).

Edwards (1917: 223) arbitrarily associated two Malayan male specimens from Leicester's collection with Theobald's types of *uncus*. Ex-

ternally, these two specimens appear unquestionably to be conspecific with the specimen selected above as the type for *uncus*. They differ externally from Philippine *uncus* in the same manner described above for the female. Also, the terminalia, as figured by Edwards (1917, fig. 8d) shows some minor differences. Unfortunately, no notes were made of these differences so it is not possible to evaluate them now.

In summary, it seems likely that the Philippine material may eventually be shown to be either subspecific to *uncus*, or a separate, closely related species. On the other hand, more extensive collecting in Malaya and the adjoining portions of the Philippines may show the variations mentioned to be normal and intraspecific. This is the only fresh-water species of the Philippines with a distribution elsewhere, and it seems likely that this may be additional evidence to show that the Philippine form is a distinct and endemic form.

In examining the types of *varietas* Leicester, it was noted that externally the two female cotypes are similar to the female selected as type for *uncus*, in both general and specific characters. In these, the number of hairs on the anterior portion of the sternopleuron was slightly higher (and thus more intermediate with the Philippine material), being 10–12 in number. Although the terminalic mount available was not too good, it appeared to resemble completely that of the female type of *uncus*.

The male cotype of *varietas* is not conspecific with the females and is here regarded as the type for that species. It is a smaller species than *uncus* and has a general grayish-brown appearance, very small basolateral spots on the tergites, and delicate, thin hind tarsal claws.

Aedes (Aedes) macrodixoa
Dyar and Shannon

1925. *Aëdes* (*Aëdes*) *macrodixoa* Dyar and Shannon, Insecutor Inscitiae Menstruus 13: 79 (1 male). Type locality: Philippines. Infanta, Tayabas Prov., Luzon. Type: Male (holotype) in U.S.N.M. Terminalia mounted.

Adult and systematics treated by Laffoon (1946: 238).

DISTRIBUTION: *Literature records*. Luzon: Infanta, Tayabas Prov. Mindoro: San Jose. Leyte: Tacloban. Mindanao: Mercedes, City of Zamboanga Prov. Parang. (Laffoon, 1946: 239.)

Unknown outside the Philippines.

DISCUSSION: This species is apparently indistinguishable externally from *uncus* and *nubicolus*. Laffoon (1946: 239) has pointed out that the female which Bohart (1945, fig. 52) identified and figured as *macrodixoa* is in actuality *dux*.

According to King and Hoogstraal (1947: 125), the male from the upper Digoel River in southern Dutch New Guinea that was identified by Brug (1932: 79) as *macrodixoa* was probably *neomacrodixoa* King and Hoogstraal.

Aedes (Aedes) nigrotarsis (Ludlow)

1908. *Pseudoskusea nigrotarsis* Ludlow, Canad. Ent. 40: 52 (female). Type locality: Philippines. Infanta, Tayabas Prov., Luzon (Warriner). Type: Female (holotype) in U.S.N.M.

1908. *Pseudoskusea mediolineata* Ludlow. Canad. Ent. 40: 332. Misidentification.

Adult, larva, and systematics treated by Laffoon (1946: 239).

DISTRIBUTION: *Literature records*. Luzon: Infanta. Subic Bay, Zambales Prov.; Camp Nichols, Rizal Prov.; Calauan, Laguna Prov.; Quezon City, Manila Prov.; Wackwack; Manila, Manila Prov. Samar: Osmena. Jinamoc Island. Leyte: Tacloban. Abuyog. Mindanao: Zamboanga and San Ramon, City of Zamboanga Prov. (Laffoon, 1946: 240.) Leyte: Tolosa (Bick, 1949: 4).

Unknown outside the Philippines.

DISCUSSION: This species is closely related to *indicus* (Theobald), which is known only

from India. Of the Philippine fauna, *campylostylus* most nearly resembles *nigrotarsis*.

Aedes (Aedes) campylostylus Laffoon

1946. *Aedes (Aedes) campylostylus* Laffoon, Jour. Wash. Acad. Sci. 36: 240 (males, females, pupae, larvae). Type locality: Philippines. Balsahan River, Palawan (nr. Iwahig) (Fitzjarrell). Type: Male (holotype), with associated larval and pupal skins, in U.S.N.M.

DISTRIBUTION: *Literature records*. Known only from the type series. Leyte: Tacloban. Mindoro: San Jose. Palawan: Balsahan and Irahuan River Valleys. Balabac: Cape Melville. Mindanao: San Ramon, City of Zamboanga Prov. (Laffoon, 1946: 242.)

Aedes (Aedes) panayensis Ludlow

1914. *Aëdes panayensis* Ludlow, Psyche 21: 159 (49 males and females). Type locality: Philippines. Iloilo, Panay (Ewing). Type: Male (lectotype) in U.S. N.M.

1929. *Aëdes (Aëdes) panaygensis* Ludl. Edwards, Notulae Ent. 9: 3. Lapsus.

Adult and systematics treated by Laffoon (1946: 242) and adult by King and Hoogstraal (1947: 119).

DISTRIBUTION: *Literature records*. Panay: Iloilo. Calicoan Island (nr. Guiuan, Samar). Culion Island. Balabac. Mindanao: Zamboanga, City of Zamboanga Prov. (Laffoon, 1946: 243.)

Outside the Philippines, known from Morotai, Schouten Islands, and Ceram.

DISCUSSION: The male of this species is especially distinctive in having the fore and mid-tarsal claws equal and toothed. On the basis of male terminalia, the closest relatives to *panayensis* appear to be the Sumatran species *dermajoensis* Brug and *prioekanensis* Brug.

The larva is undescribed.

Aedes (Aedes) butleri Theobald

1901. *Aedes Butleri* Theobald, Mon. Cul. 2: 230 (3 females). Type locality: Malaya. Selangor (Butler). Type: 3 females (cotypes) in B.M.† The specimen which does not have the terminalia mounted is probably a *Skusea* species. The other two specimens, both of which have the terminalia mounted, are conspecific and are here selected as representing *butleri*.

1903. *Skusea diurna* Theobald, Entomologist 36: 259 (female). Type locality: Malaya. Jugra, nr. Kuala Lumpur (Durham). Type: Female (holotype) in B.M.† Terminalia mounted.

1903. *Verralina Butleri*. Theobald. Theobald, Mon. Cul. 3: 295. Different combination.

1910. *Stegomyia hatiensis* Carter, Entomologist 43: 275 (5 females). Type locality: Cochin China. Ha-tien (Broquet). Type: 2 females (? lectotypes) in B.M.† Terminalia mounted.

1924. *Aëdes (Skusea) umbrosus* Brug, Bul. Ent. Res. 14: 437 (4 males, 2 females). Type locality: Borneo. Tanah Grogot, S. E. Borneo (Brug). Type: 2 males, 1 female (cotypes) in B.M.† Terminalia mounted for 1 male and 1 female.

1928. *Aëdes (Aëdes) umbrosus*, Brug. Edwards and Given, Bul. Ent. Res. 18: 345. Description of larva.

1946. *Aedes (Aedes) umbrosus* Brug. Laffoon, Jour. Wash. Acad. Sci. 36: 243. Tentative synonymy to *butleri*.

Barraud (1934: 296), female only, male is probably *lugubris* Barraud. Laffoon (1946: 243), adult, larva, and systematics.

DISTRIBUTION: *Literature records*. Leyte. Tacloban and Palo. Culion Island. Palawan: Iwahig and Puerto Princesa. (Laffoon, 1946: 244.)

Outside the Philippines known from Borneo, Java, Malaya, Cochin China, India, and the Andamans.

DISCUSSION: The types of *butleri* have been examined, and a female terminalic slide of a Palawan specimen was compared with them. There appears to be no essential differences.

As pointed out in the synonymic table, the female without terminalia separated is an undetermined species. It possesses broad scales on the scutellum and on *ppn* and lacks fine hairs on the mesepimeron. It is probably a *Skusea* species, but this point was not checked.

Two female terminalia labeled as this species by Barraud in the British Museum collection from the Andamans (ix. 1911. Christophers) were examined and seemed to check satisfactorily with the types.

The types of *diurna* and *hatiensis* were examined and found to be *butleri*, as previously indicated by Edwards and Barraud. Laffoon (1946: 245) had questioned the synonymy of *hatiensis* because Carter in his description said that the scutellar scales were similar to those covering the greater portion of the head, thus implying that they were broad. However, in examining the two Ha-tien specimens pinned under *butleri* in the British Museum, it was found that both are pinned through the scutellum, making it now impossible to know what type of scales were present. It seems likely that the missing three specimens (two from Ha-tien and one from Saigon) had broad scutellar scales and were moved by a later worker (probably Edwards) to an *Aedes* species with broad scutellar scales.

The types of *umbrosus* were studied, and the female terminalia was compared with that of a specimen from Palawan. No essential differences were found. No Philippine male specimen was available for direct comparison, but the type male terminalia was compared to the figure given by Laffoon (1946, fig. 1) and found to agree perfectly, except that the type specimen (only one had the terminalia mounted) had three proximated subapical spines instead of only two as figured by Laffoon, had only 13–15 verticillate bristles on the antennal segments, and was somewhat smaller. No differences were found between the female type of *umbrosus* and the types of *butleri*, *diurna*, and *hatiensis*. The Javan specimen mentioned in the original description of *umbrosus* was not seen in the British Museum.

As pointed out by Laffoon (1946: 245), the male terminalia described and figured by Edwards (in Barraud, 1934, fig. 73e, f) as the male of *butleri* is probably the male of *lugubris*. No Indian specimens of *butleri* were seen in the British Museum.

Subgenus CANCRAËDES Edwards

1929. *Cancraëdes* Edwards, Bul. Ent. Res. 20: 342. Genotype: *cancricomes* Edwards (Andaman Islands).

ADULT: Brownish species without special ornamentation. Palpi very short in both sexes. Vertex and scutellum all broad-scaled. Stout dorsocentral bristles present, but no acrostichals. Paratergite not scaled. Lower mesepimeral bristles present. Tarsal claws simple in both sexes. *Terminalia:* Basistyle short, with a complex group of apical and subapical appendages. Dististyle very short, simple, without articulated appendage. Claspettes absent. Mesosome divided, each lobe with an elongate spine externally.

LARVA: The larva of only one species has been described. As in subgenus *Aedes* except: Comb with about 70 scales arranged in a patch. Ventral brush with about 8 tufts, all borne on a laterally connected barred area. Habitat, crab holes and pools in mangrove swamps.

DISTRIBUTION: The four known species (a fifth species, *kanarensis* Edwards, 1934, was questioningly placed in this subgenus by the describer) are confined to the Oriental region.

SYSTEMATICS: Except for *kanarensis*, this subgenus contains a very uniform group of species. *A. kanarensis*, which has not been included in the above subgeneric description, differs markedly from the other known species in the subgenus because of its scutal and tarsal pale scaling.

Aedes (Cancraëdes) miachaetessus Dyar and Shannon

Fig. 12

1925. *Aëdes* (*Skusea*) *miachaetessa* Dyar and

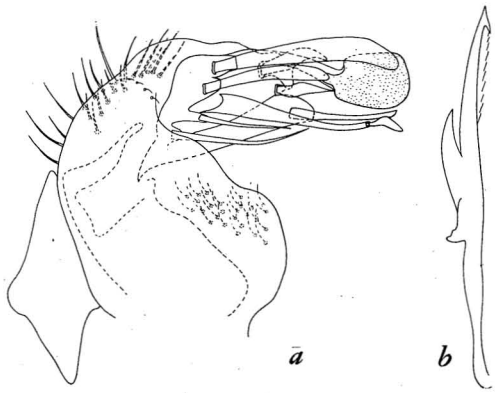

FIG. 12. *A. (Cancraëdes) miachaetessus.* Male terminalia (Samar). *a*, Lateral aspect of basistyle, lateral surface of basistyle omitted; *b*, left half of mesosome.

Shannon, Insecutor Inscitiae Menstruus 13: 78 (2 females). Type locality: Philippines. Camp Stotsenberg, Pampanga Prov. Luzon (Tefft). Type: 2 females (cotypes) in U.S.N.M.† One of these specimens is here designated lectotype.

1929. *A. (?Cancraëdes) miachaetessa*, Dyar and Shannon. Edwards, Bul. Ent. Res. 20: 342. Different combination.

ADULT: A very small dark species, without special markings.

Male. Wing length about 2.1 mm. *Head:* Proboscis dark. Palpus very short, no longer than the clypeus, dark. Torus bare. Vertex with broad dark scales, a few dark upright-forked scales on nape. *Thorax:* Scutal integument dark brown; with narrow dark scaling. Scutellar lobes with broad dark scales. *Apn* and *ppn* with a few narrow-curved dark scales. Pleuron yellowish brown in color, bare of scales except for a few translucent dusky broad scales dorsally on sternopleuron; a few short pale hairs dorsoanteriorly and ventroposteriorly on sternopleuron; 1–2 stout lower mesepimeral bristles. *Legs:* All dark. Tarsal claws simple, those of fore and midlegs unequal. *Wings:* Dark-scaled. Halter knob dark-scaled. *Abdomen:* Tergites and sternites dark-scaled. Segments V–VIII noticeably enlarged, VII–VIII much retracted, sternite VIII with apical half densely covered with very long hairs. *Terminalia:* As in figures. The one figure is a lateral view of the left basistyle. The basistyle in this species is extremely bulbous, and in order to show the dististyle and its subapical appendages adequately the outer surface of the basistyle is omitted from the drawing.

Female. Similar to the male except that the tergites have white basolateral patches, and the sternites are white basally. Tarsal claws equal, simple.

LARVA: Unknown.

BIONOMICS: Two males were collected from the mouths of crab holes.

DISTRIBUTION: *Specimens examined.* R.K.L. Samar: 1 male, Osmena (Laffoon, Knight). Mindanao: 1 male, Zamboanga (Knight, Laffoon). U.S.N.M. Luzon: 2 female types, Camp Stotsenberg, Pampanga Prov.

Not known from outside the Philippines. The two females from Koh Kut Island, Gulf of Siam, listed by Dyar and Shannon (1925: 78) have been examined (in U.S.N.M.) and are believed to be *curtipes* on the basis of the dark pleurae.

DISCUSSION: The male of this species had not previously been described. Of course, it is quite possible that the association of sexes made here is incorrect as the correlation is made solely on general appearance.

Aedes (Cancraëdes) curtipes Edwards

Fig. 13

1915. *Aëdes ?curtipes* Edwards, Bul. Ent. Res. 5: 283 (4 females). Type locality: Borneo. Kuching (?), Sarawak (Moulton). Type: Female (holotype) in B.M.†

1928. *Aëdes (Skusea) curtipes*, Edw. Edwards, Bul. Ent. Res. 18: 274. Different combination.

1929. *A. (Cancraëdes) curtipes*, Edw. Edwards, Bul. Ent. Res. 20: 342. Different combination.

Male described by Edwards (1928: 274). Larva described by Edwards and Given (1928: 346).

ADULT: *Male.* Wing length about 2.0 mm. Very similar to *miachaetessus* but differing slightly as follows: Pleural integument grayish brown to brown in color. *Ppn* with several fine short hairs ventroposteriorly. Mesepimeron with several fine pale hairs between the dorsal hair tuft and the lower mesepimeral bristles. Hind femur with basal half partially pale-scaled anteriorly. *Terminalia:* Resembling that of *miachaetessus* but the subapical appendages differing as figured. The basal portion of the basistyle of the single available specimen was somewhat broken so that details in that portion may not be accurately illustrated.

Female. As in male except that there are laterobasal pale patches on most of the tergites and basal paler scales on the sternites. Torus with some dark scales and hairs medially.

LARVA (from Edwards and Given, 1928: 346. No larvae taken in P.I.): *Head:* Antenna almost as long as head, with numerous spicules; antennal hair tuft with 5–6 branches, inserted just before middle and reaching the tip of the antenna. Preclypeal spines long, bristle-like. Head hair 4 with about 6 branches, very small; 5 with 3; 6 with 2; 7 with 7–10; 8 single; 5, 6, and 7 all large and plumose, and arranged in a slightly curved line. Mentum with about 15 lateral teeth. *Thorax:* Lateral tufts large and plumose; associated spines very short. *Abdomen:* Lateral tufts double, plumose on I and II. Comb with about 70 scales, each long, narrow, sharp, and simple. Siphon rather strongly tapering on the outer half, index about 2.7; acus distinct, narrow; 6–8 pecten teeth, mostly rather widely spaced and extending a little beyond middle of siphon, each tooth with 2–3 very strong denticles; siphon hair tuft with 3–5 branches, inserted beyond distal pecten tooth. Anal plate small; ventral brush of about 8 tufts, each tuft with a rather long stalk, no tufts off the barred area. Anal gills short, somewhat pear-shaped, dorsal pair almost as long as anal plate, ventral pair shorter.

BIONOMICS: Adults were collected flying at the edge of a mangrove swamp and from resting places inside the openings of crab holes. The larvae were not taken. However, Edwards and Given (1928: 346) reported the larvae from mangrove pot-holes.

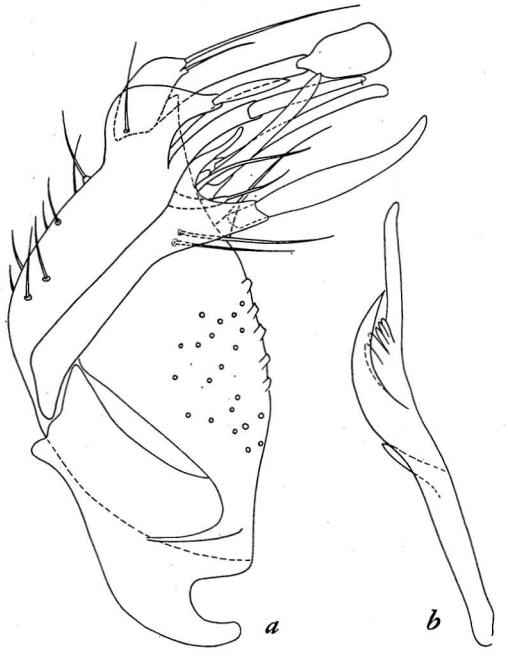

FIG. 13. *A.* (*Cancraëdes*) *curtipes.* Male terminalia (Palawan). *a*, Mesal aspect of basistyle; *b*, left half of mesosome.

DISTRIBUTION: *Specimens examined.* R.K.L. Palawan: 1 male, 5 females, Iwahig Penal Colony (Laffoon). U.S.N.M. Palawan: 2 females, Puerto Princesa (19th M.G.L.).

Not previously reported from the Philippines.

Outside the Philippines this species is known from Borneo and Malaya. As pointed out in the treatment of *miachaetessus*, it is believed that the two female specimens in the U.S.N.M. from Koh Kut Island, Gulf of Siam, are this species.

DISCUSSION: The type was studied, but unfortunately a male terminalia was not seen. However, the male terminalia of the Palawan specimen agrees with Edwards' (1928, fig. 1) figure of the male terminalia of *curtipes*, except that he does not show the subapical append-

age A that is present in the Palawan specimen (see figure).

AEDES OF UNKNOWN SUBGENERA

Aedes (?) platylepidus Knight and Hull

1951. Aedes (?) *platylepidus* Knight and Hull, Pacific Sci. 5: 201 (3 females). Type locality: Philippines. Puerto Princesa, Palawan (Laffoon and Johnson). Type: Female (holotype)in U.S.N.M.†

DISTRIBUTION: *Specimens examined.* Known only from type series. Palawan: Puerto Princesa. Balabac: Cape Melville.

DISCUSSION: The male is unknown and the larva is not described. The type series was obtained from a larval collection but unfortunately no associated larval material was retained.

This species is strikingly different, on the basis of the broad plate-like dark (with metallic reflections) scutal and scutellar scales, from all other known Pacific *Aedes* species. Lack of the male and larva, together with the rather aberrant characters of the female, prevent the making of a definite decision at this time as to the subgeneric position in *Aedes* of *platylepidus*. The possible relationships of this species are discussed in some detail in the original description.

Aedes, species unknown

Three larval specimens from Palawan and Balabac represent an unknown aedine species. It is quite possible that this is either the larva of *Aedes platylepidus* or of *Heizmannia scintillans* Ludlow, but in the absence of associated material it is impossible to say definitely at this time.

LARVA: *Head:* Antenna smooth, rather stocky; antennal hair single, inserted near apex. Mouth brush with comb-like tips. Hair 4 single, rather long, dark, curved inward; 5 single; 6 with 2–3 branches; 7 single or double, small; 8 single; 9 double; 12 with 2–3; 13 and 14 single; 15 with 1–3; 17 and 18 single; 20 double; 18 is inserted just mesad and ventral to 17, rather than near the lower corner of the mentum. Mentum with 8–9 lateral teeth. *Thorax:* Prothoracic hairs 1 and 2 single; 3 with 3 branches. Mesothoracic hair 9 single; thoracic hairs in general quite sparsely branched. *Abdomen:* Dorsolateral hair on I with 2–3 branches; on II double. Lateral hair on I double; on II single or double; on III and IV with 3–4; on V and VI with 5–6. Pentad hair 1 with 2–3; 2 and 4 single; 3 with 2–6; 5 with 2–3. Comb with 6 teeth in a curved row, each tooth long, slender, sharply pointed, with a small amount of fringe laterally at the base of the spine. Siphon smooth, with an attached acus, index 2.1–2.4; 7–12 pecten teeth in an irregular row, each with fine fringe basally on ventral side and occasionally on dorsal side also; siphon hair tuft with 4–6 branches, inserted either before, near, or beyond the last pecten tooth. Anal plate apparently complete, with a few small spicules laterally on the posterior margin; *lh* with 3–4 short, rather stout branches; *isc* single (once double), *osc* single; ventral brush of 10 hairs, each single except for basal pair with 3–5 branches; no barred area present. Anal gills finger-like, dorsal pair slightly shorter than ventral pair and 2.2–2.5 times longer than anal plate.

BIONOMICS: This larva was taken on one occasion from water collected in a large metal packing container in the jungle and on another from water collected in a large, thorny palm frond lying on the ground at the edge of a mangrove area.

DISTRIBUTION: *Specimens examined.* R.K.L. Palawan: 2 larvae (#854) Irahuan River, 3 miles inland (Laffoon). Balabac: 1 larva (#1611), Cape Melville (Johnson).

One of the Palawan larvae is deposited in the U. S. National Museum as *Aedes* sp. #46. The other two are retained in the Knight collection.

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